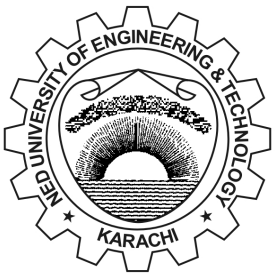
Practical Workbook
Fundamentals of Computer Engineering



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Dept. of Computer & Information Systems Engineering

NED University of Engineering & Technology,

Karachi – 75270, Pakistan

Practical Workbook
Fundamentals of Computer Engineering

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INTRODUCTION

Introduction to computers is an introductory course on computers and its related fields. It gives to the students the elementary knowledge of various computer related courses, which they study throughout the four years of their stay at the university. Putting it the other way, this course helps students make themselves acquainted with computer and information systems engineering. The objective of the practical work presented in this workbook is to provide necessary laboratory assistance to the students regarding this course.

This workbook comprises of five sections. First section begins with the introduction and testing of various electronic components. Also, students are made to implement certain circuits and observe functions of some related ICs. Second section helps in exploring various features of different application software like Microsoft Word, Excel and PowerPoint. Learning these software can help students in better preparation of their presentation and report work for various courses. In this section the fundamental concepts and the powerful features that DOS provides for computers are discussed.

Third section covers Computer Hardware. First laboratory session give introduction to the basics of logic design. Here students learn the operation of basic logic gates' ICs and there use to implement various logic functions on breadboard. Second lab covers Electronic Workbench as a Computer Aided Design - CAD software.

Forth section covers VB.NET programming. In the first laboratory session students will create projects using VB.NET in visual studio. In the next lab, students learn serial communication between computers using HyperTerminal and writing a program in VB.NET.

The last section covers the basic use of HTML which will be helpful in understanding the concepts of web pages and their designing.

Some of the activities in this workbook incorporate detailed theories on various topics, as they may not be covered in the respective theory classes of this course. Exercises are included where necessary.

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Section One:

Working With Different Electronic Circuit Components

Components Required:

Resistors, Different Capacitors, Transistors, Diodes And Inductor, Digital Multimeter, Oscilloscope, Function Generator, Power Supplies, 555 Timer IC, Connecting Wires, Bread Board, Transformer.

Lab Session 01

OBJECT

Exploring the various electronic and PC components

THEORY

Conductors

A conductor is any substance that allows an electrical charge to flow easily through it. Metals, such as copper, are good conductors because their atoms have many electrons (negatively charged particles) that can readily flow.

Insulators

An insulator is any substance that cannot easily allow a flow of charge. Plastics and ceramics are good insulators. Electrons in the molecules of these materials are restricted. They cannot readily form an electric current.

Capacitor

Capacitor is an electrical component used for storing charge, composed of pairs of conducting plates separated by an insulating material called a dielectric. A potential difference builds up as charge is stored on the plates, increasing the electric field between them, until it discharges all its energy in a rapid burst.

Semiconductors

Some nonmetals, such as silicon, conduct electricity under certain conditions, but are not good conductors. Because of this, they are classified as semiconductors. In a pure state, they conduct electricity very poorly and so they are “doped” with impurities to make them better conductors. Semiconductors are used to make many electronic components.

Doping

The process of modifying the structure of a semi-conducting material such as silicon to enhance its conducting properties. Doping can involve the addition of atoms with extra electrons to carry negative charge, or the insertion of electron-deficient atoms, creating “holes” that act as positive charge carriers.

PN Junction

When one n-type semi-conductor and one p-type semi- conductor are placed together, the resulting device has some very special properties. The region that is formed by adjoining a p-type semiconductor and an n-type semiconductor is called a *pn junction*.In order to "forward-bias" the device and decrease the size of the depletion region, one should set up an electric field such that a positive voltage is in contact with the p-type end of the device and a negative voltage is in contact with the n-type semi-conductor. This results in a decrease in the width of the depletion region and, consequently, the energy needed to cross that barrier. This makes is easier

for current to flow and, if the applied voltages are large enough (typically 0.6 V for silicon), the pn-device will start to conduct freely. In order to increase the size of the depletion region and thereby make it tougher for current to flow one should "reverse-bias" the device. To do this, electric voltages are applied such that a positive voltage is in contact with the n-type end of the device, and a negative voltage is placed in contact with the p-type semi-conductor. This results in an enlargement of the depletion region and, consequently, the energy gap between regions.

Diodes

A *diode* is an electronic component that converts alternating current (AC) in an electric circuit to direct current (DC). Alternating current (which is the type used around the home) travels in one direction first and then in the opposite direction. Direct current flows in one direction only, and can be made by batteries. Diodes work by restricting the flow of electrons to one direction only.

Testing a diode

To test a silicon diode such as a 1N914 or a 1N4001, all you need is an ohm-meter. If you are using an analog VOM type meter, set the meter to one of the lower ohms scale, say 0-2K, and measure the resistance of the diode both ways. If you get zero both ways, the diode is faulty. If you et INFINITY both ways, the diode is faulty again. If you get INFINITY one way and some reading the other way (the value is not important) then the diode is good.

Transistors

A *transistor* is an electronic semiconductor device in which one electric current controls another current. It can be used either as an amplifier or a switch. They are made by sandwiching one type of doped semiconductor between two layers of another type. The three parts that make up a transistor are the base, the emitter, and the collector. Computers contain millions of transistors that respond in a few nanoseconds to changes in current. This enables computers to operate extremely quickly.

Junction Transistor

A junction transistor consists of regions of *n*-type (negative-type) or *p*-type (positive-type) material, made by adding an appropriate impurity in a process known as doping. The base must be of the opposite type of material from that of the other two electrodes, and so both *npn* and *pnp* transistors exist.

NPN and PNP Transistor

The transistor in which a p-type material is sandwiched between two n-type materials is called an *npn transistor*.The transistor in which an n-type material is sandwiched between two p-type materials is called a *pnp transistor*.

Testing a transistor for NPN or PNP

Assuming you know where C, B, and E are on the transistor, do the following. Connect the positive lead of your Ohm-meter to the base. Touch the other lead of your meter to the collector. If you get a reading, the transistor is NPN. To verify, move the lead from the collector to the emitter and you should still get a reading.

Transformers

A *transformer* is two coils of wire (called the primary coil and the secondary coil) wrapped around a piece of iron. It makes AC voltages larger or smaller, depending on how the coils are arranged. A transformer with more windings in the secondary coil than in the primary increases voltage and is called a step-up transformer. The reverse arrangement, a step-down transformer, decreases voltage.

Components of a Pc

System Unit

It is the main computer system cabinet in a PC, which usually houses the power supply, motherboard, and some storage devices.

Mother Board

It is the main circuit board in a microprocessor system. It normally includes the microprocessor chip (or CPU), main memory (RAM) chips, all related support circuitry, and the expansion slots for plugging in additional components. It is also known as system board.

Read Only Memory (ROM)

It is a type of memory in which instructions to perform operations critical to a computer are stored on integrated (chips) in permanent, non-volatile form. The instructions are normally recorded on the chips by the manufacturer.

Random Access Memory (RAM)

It is the name given to the integrated circuits (chips) that make up main memory, which provides volatile temporary storage of data and program instructions that the CPU is using; data and instructions can be retrieved at random, no matter where they are located in main memory. RAM is used for storing operating system software instructions and for temporary storage of applications software instructions, input data, and output data.

On the basis of pin configuration, two types of RAM chips are available in the market:

- SIMM – Single Inline Memory Module, all pins are aligned on one side of the chip.
- DIMM – Dual Inline Memory Module, pins are aligned on both sides of the chip.

On the basis of internal cell design, two types of RAM are there:

- DRAM – Dynamic Random Access Memory, made of capacitors, used for most main memories.
- SRAM – Static Random Access Memory, made of flip flops, used for some specialized purposes within the main memory.

Cache Memory

It is a special high-speed memory area that the CPU can quickly access. It comprises a small area of RAM created in addition to the computer's main memory (RAM); a copy of the most frequently used data and instructions is kept in the cache so the CPU can look in the cache first, which makes the computer run faster. Cache memory is usually located right on the microprocessor chip.

Disk Drive
Devices into which a diskette (floppy disk) or hard disk is placed for storing and retrieving data.Types of disk include Floppy Disk,Hard Disk,Compact Disk

Processor Chip
It is an integrated circuit (chip) containing the CPU circuitry for a microprocessor. CPU is the brain of the computer; the part of the computer composed of electrical circuitry directing most of the computer system's activities. It consists of the control unit and the arithmetic/logic unit (ALU) connected by a bus.

Other parts include Parallel Ports,Serial Ports,System Clock/Timer,Power Supply,Data Cables, Power Cables,Expansion Slot,Display Screens ,Graphic Adapter Cards,Sound Cards,Network Cards,Modem Cards,Math Coprocessor

EXERCISE

Resistors # 1	***Color***	***Value***
Band # 1		
Band # 2		
Multiplier		
Tolerance		
Total Resistance		
Observed Resistance		
Resistor # 2		
Band # 1		
Band # 2		
Multiplier		
Tolerance		
Total Resistance		
Observed Resistance		
Resistor # 3		
Band # 1		
Band # 2		
Multiplier		
Tolerance		
Total Resistance		
Observed Resistance		
Resistor # 4		
Band # 1		
Band # 2		
Multiplier		
Tolerance		
Total Resistance		
Observed Resistance		

Diode

	Diode #	*Good / Bad*
Diode # 1		
Diode # 2		

Capacitor

	Printed Value
Capacitor # 1	
Capacitor # 2	
Capacitor # 3	

Transistor

	Transistor #	*Type (NPN/PNP)*
Transistor # 1		
Transistor # 1		

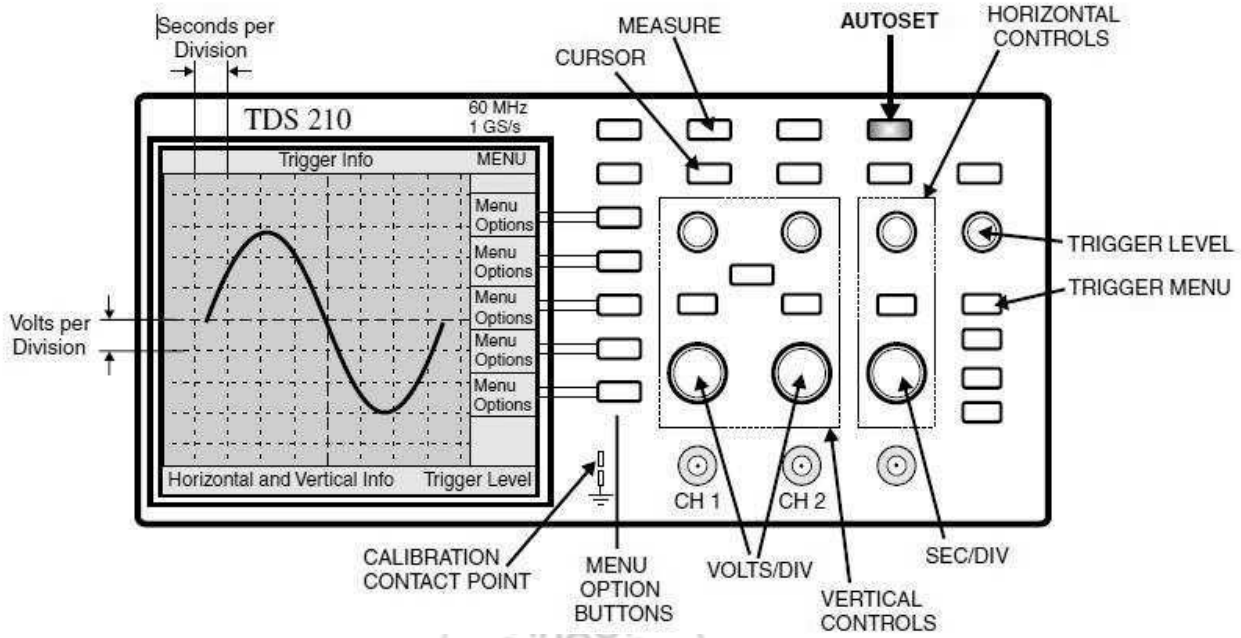
- Find and list various shardware and their configuration attached to your system.

Lab Session 02

OBJECT

Familiarization and working with oscilloscope, function generator and 555 timer IC

THEORY



Until the 1990s, most oscilloscopes were purely 'analog' devices: an input voltage passed through an amplifier and was applied to the deflection plates of a CRT to control the position of the electron beam. The position of the beam was thus a direct analog of the input voltage. In the past few years, analog scopes have been largely superseded by digital devices suchas the TDS210 (although low-end analog scopes are still in common use for TV repair, etc.).Adigital scope operates on the same principle as a digital music recorder. In a digital scope, the input signal is sampled, digitized, and stored in memory. The digitized signal can then be displayed on a computer screen. One of your first objectives will be to set up the scope to do some of the things for which you may already have used simpler scopes. After that, you can learn about multiple traces and triggering. In order to have something to look at on the scope, you can use your breadboard's built-in function generator, a device capable of producing square waves, sinusoidal waves, and triangular waves of adjustable amplitude and frequency. But start by using the built-in 'calibrator' signal provided by the scope on a metal contact labeled 'probe comp' (or something similar), often located near the lower right-hand corner of the display screen.

Display

Your oscilloscope user's manual will explain the information displayed on the scope's screen. Record the various settings: timebase calibration, vertical scale factors, etc.

Vertical controls

There is a set of 'vertical' controls for each channel These adjust the sensitivity (volts per vertical division on the screen) and offset (the vertical position on the screen that corresponds to zero volts). The 'CH 1 ' and 'CH 2 ' menu buttons can be used to turn the display of each channel on or off; they also select which control settings are programmed by the push-buttons just to the right of the screen.

Horizontal sweep

To the right of the vertical controls are the horizontal controls .Normally, the scope displays voltage on the vertical axis and time on the horizontal axis. The sec/div knob sets the sensitivity of the horizontal axis, i.e. the interval of time per horizontal division on the screen. The position knob moves the image horizontally on the screen.

Triggering

Triggering is probably the most complicated function performed by the scope. To create a stable image of a repetitive waveform, the scope must 'trigger' its display at a particular voltage, known as the trigger 'threshold'. The display is synchronized whenever the input signal crosses that voltage, so that many images of the signal occurring one after another can be superimposed in the same place on the screen. The level knob sets the threshold voltage for triggering. You can select whether triggering occurs when the threshold voltage is crossed from below('rising-edge' triggering) or from above ('falling-edge' triggering) using the trigger menu (or, for some scope models, using trigger control knobs and switches). You can also select the signal source for the triggering circuitry to be channel 1, channel 2, an external trigger signal, or the 120 V AC power line, and control various other triggering featuresas well.

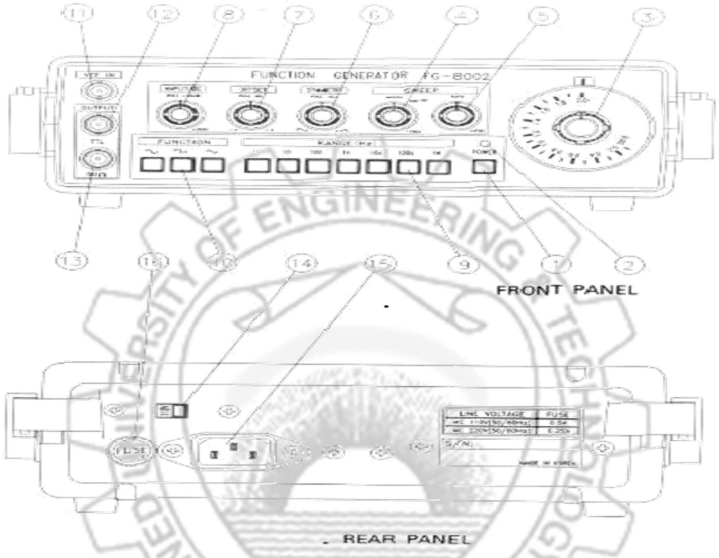
Function Generator

Function generators are among the most important and versatile piece of equipment. In electronics design and troubleshooting, the circuit under scrutiny often requires a controllable signal to simulate its normal operation. The testing of physical system and transducers often needs stable and reliable signals. The signal levels needed range from micro volts to tens of volts or more.Modern DDS(Direct Digital Synthesis) function generator are able to prove a wide variety of signals. Today`s basic units are capable of sine, square and triangle outputs from less than 1 Hz to at least 1 MHz, with variable amplitude and adjustable DC offset. Many generators include extra features, such as higher frequency capability, variable symmetry, frequency sweep, AM / FM operation and gated burst mode. More advance model offer a variety of additional waveforms and arbitrary waveforms generator can supply user can define periodic waveforms.

Function generators are used where stable and repeatable stimulus signals are needed. Here are some common use and users.

- Research and development
- Educational institutions
- Electronics and electrical equipment repair businesses
- Stimulus/response testing, frequency response characterization, and in-circuit signal injection
- Electronic hobbyists

Function Generator FG-8002



FRONT PANEL

1. POWER Switch
   Pressing this push switch turns on power.

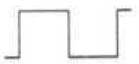
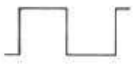
2. POWER Lamp
   LED lights up when power is on.

3. Frequency Dial
   This Variable potentiometer varies output frequency within the selected range with the frequency range selector.

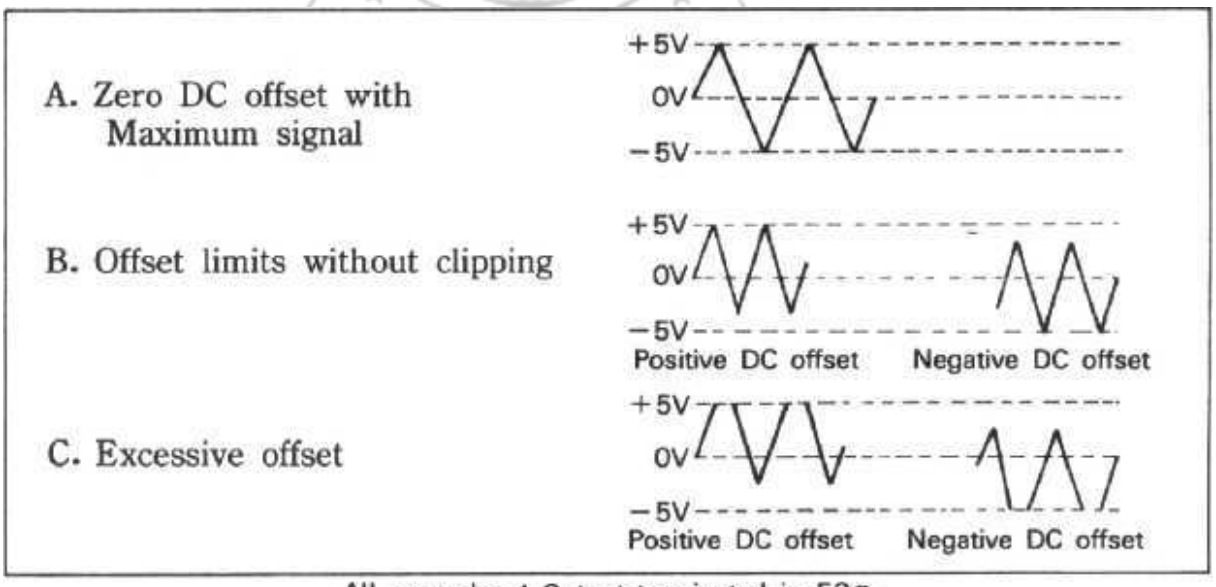
4. SWEEP WIDTH / PULL ON Control
   Pulling the knob selects internal sweep and rotating it controls sweep width. Rotate it counter clockwise to get a minimum sweep width (1: 1) and rotate it clockwise to get a maximum sweep width (100:1). To get a maximum sweep width, set the frequency dial to minimum scale (below 0.2 scales). Pushing the knob selects external sweep, which is implemented when external sweep voltage is applied to the VCF input connector.

5. SWEEP RATE Control
This controls weep rate (sweep frequency) of internal sweep oscillator.

6. SYMMERTRY Control
This controls symmetry (duty cycle) of output signal waveform within range of 10: 1 to 1: 10.
Following figure hows waveforms varied by symmetry control.

Knob position / Waveform	PUSH	PULL		
		Center	Counter-clockwise	Clockwise
Square Wave				
Triangle Wave				
Sine Wave				
TTL Wave				

7. DC OFFSET Control
The DC offset control can provide up to ± 10V open circuit, or ± 5V into 50.
Clockwise rotation admixes positive voltage and counter clockwise rotation admixes negative voltage.Ω.



All examples : Output terminated in 50Ω

8. AMPLITUDE/PULL – 20dB Control

Amplitude of output signal can be controlled by this knob. Maximum attenuation is more than 20dB when the knob is rotated fully counter clockwise. Pulling this knob make attenuation of 20dB, so the output signal can be attenuated by 40dB when this is pulled and rotated fully counter clockwise.

9. FREQUENCY RANGE Selector
Select one of the following seven ranges of oscillation frequency as desired.

10. FUNCTION Selector
Push one of the three knobs to get a desired waveform out of sine wave, triangle wave and square wave.

11. VCF IN Connector
Frequency of output signal can be varied by applying voltage to this connector. Application of voltage from 0 to + 10V provides frequency variation up to 100: 1.To maximum variation, set the frequency dial to minimum scale. (below 0.2 scale)

12. TTL – OUTPUT Connector
TTL – level square waves output from here.

13. OUTPUT Connector
This is the main output connector for sine wave, triangle wave and square wave selected with the FUNCTION Selector.

14. Voltage Selector
Select rated voltage 110V or 220V according to the power line voltage to be applied to the instrument.

15. Power Cord
Connect to a power connector for supplying AC power.

16. FUSE Holder
Fuse holder for AC power supply.Use a specified fuse for safety of the instrument.

Working with Function Generator

The purpose of this lab is familiarizing you with the basic functions of an oscilloscope and function generators.

1. **Setting Up The Oscilloscope and Function Generator**
    a. Turn on the oscilloscope with the button on the top. Attach a BNC to alligator cable to the Channel 1 BNC input connector.
    b. On the oscilloscope, set the following controls:
        - Channel 1 Volts / Division = 2 (The *CH 1* menu button enables/disables the channel, turn *VOLTS/DIV* knob).
        - Time / Division = 250µs (Turn *SECONDS/DIV* knob).

- Trigger Source = Channel 1 (Push *TRIGGER MENU*, select *Channel 1* from the *Source* menu).

c. Turn on the function generator. Attach another BNC to alligator cable to the output connector (be careful not to attach it to the Sync (TTL) output). Attach the red alligator clips from both cables together. Repeat with the black clips.

d. You will now configure the function generator to output a 10Vpp (peak-to-peak), 1 KHz sinusoidal wave.
   - Use the output arrows to select the sinusoidal wave pattern.
   - Highlight the Frequency option (*FREQ* under *Display/Modify*) and use the *MODIFIER* and *RANGE* controls to set an output frequency of 1 KHz.
   - Highlight the Amplitude option (*AMPL*) and adjust Vp (peak voltage) for 5 volts.

e. You should now see a sinusoidal wave on the oscilloscope. If not, then ask a lab assistant for help. The problem may be with some oscilloscope settings, some "buried" function generator settings, or the physical connection.

f. Now, make sure the sinusoidal wave is vertically centred on your scope.
   - Press the *Ch 1* menu button
   - Select the *Ground* option under the *Coupling* submenu.
   - The Channel 1 vertical position should be set to 0.00 divs (0.00V). If it is not, adjust using the "Vertical Position" knob.

g. Since the cosine wave is the standard for sinusoidal wave patterns, adjust the horizontal position of the wave so that the positive peak amplitude intercepts the vertical axis. This can be adjusted using the "Horizontal Position".

You should now have a stable cosine wave with an amplitude of 5 volts, a phase shift of 0 degrees, and a frequency of 1 KHz (see equation 1) display on the oscilloscope.

h. Using the cursors: The oscilloscopes are equipped with a set of horizontal and vertical cursors to aid in obtaining measurements. You can use these to measure various parameters like peak voltage, period, and frequency.
   - Measure the ***Peak-to-Peak*** amplitude of the waveform using the horizontal cursors. To do this, press **Cursor**, and then select *Voltage* under the **Type** submenu. Use the **Vertical Position** knobs to place the cursors at Vp and -Vp. Under the delta submenu the peak to peak voltage will be recorded. Repeat this process to measure the ***Peak*** Voltage.
   - Measure both the ***Period*** and ***Frequency*** of the waveform using the vertical cursors. To do this, press **Cursor**, and then select *Time* under the **Type** submenu. Use the **Vertical Position** knobs to again place the cursors. The **delta** submenu displays both the period and frequency measurements.

EXERCISES

1. Perform the same operation as demonstrated in the above exercise using a square wave and write down you observations along with the waveform you observe on the system

2. Measure the parameters for the following sinusoidal wave

$$v(t) = 5 \cos(62832t + 0) \text{ volts}$$

   a. What is the frequency of the waveform in hertz? What is the period? What is Vp?

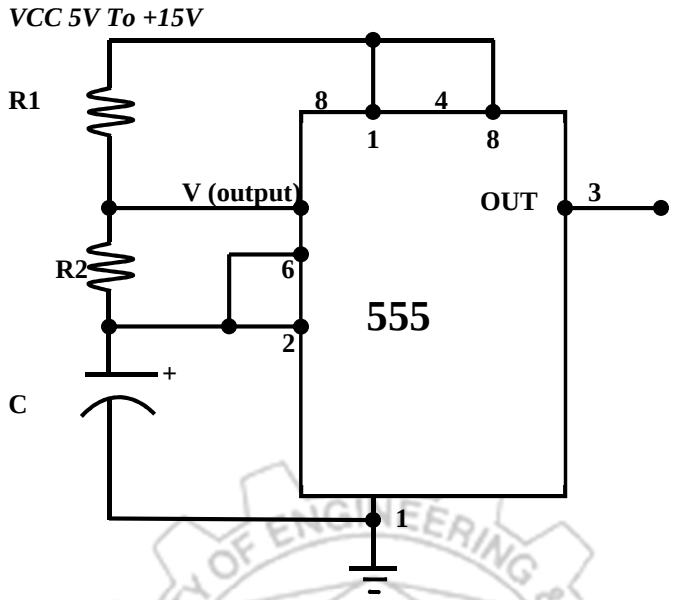
   b. Adjust the function generator to output the waveform in equation 2. Start bringing up the frequency from 1 KHz to the value you calculated in part a, and notice what happens to the waveform displayed on the oscilloscope. Readjust the sec/div knob on the scope until one or two periods take up most of the screen. What happens to the signal displayed on the scope as the frequency from the function generator gets higher?

c. With the cursors, measure Vp (peak) and Vpp (peak-to-peak) and record these values in your lab book.

d. With the cursors, measure the frequency of the waveform and record this value in your lab book.

e. Sketch the waveform as best as you can in your lab book. Be sure to fully label your plot with axes, units and divisions.

555 Timer IC



The 555 timer IC was first introduced around 1971 by the Signetic Corporation as the SE555/NE555 and was called "the IC time machine". This timer uses a maze of transistors, diodes, and the resistors. The 555 comes in two packages, either the round metal can called the "T Packager" or the more familiar 8-pin Div 'V' package. Inside the IC, are the resistors and 3 diodes depending on the manufacturer. The equivalent circuit providing the functions of control, triggering, level sensing or comparison, discharge and power output. Some features of 555 IC are: *Supply voltage between 4.5 and 18 volts, supply 3 to 6 mA and rise and fall time of 100 msec*. There are two modes to work. Monostable mode also known as one shot pulse generator and the astable mode also called oscillator.

Relation of 555 Timer IC

The frequency, *f* which is generated is given by: $f = \frac{1.44}{(R_1 + 2R_2)\,C}$

OBSERVATIONS & CALCULATIONS

	C	***R_1***	***R_2***	***Calculated Frequency***	***Observed Frequency***
1					
2					
3					

Lab Session 03

OBJECT

Constructing a full wave rectifier and half wave rectifier

THEORY

PN Junction Diode

If donor impurities are introduced into one side and acceptor impurities into the other side of a single crystal of semiconductor ,a PN junction is formed. It is also called a diode.

Capacitance

A capacitor stores electric charge. It consists of a pair of plates set very close to each other but separated by an insulator layer. When voltage is applied across a capacitor, it stores charge. If batteries are now removed, the charge remains trapped in the capacitor. This trapped charge is called capacitance. Capacitance is measured in Farad (F). capacitors are used in different values like, pico farad (pF), Nano farad (nF), micro farad (μF), etc.

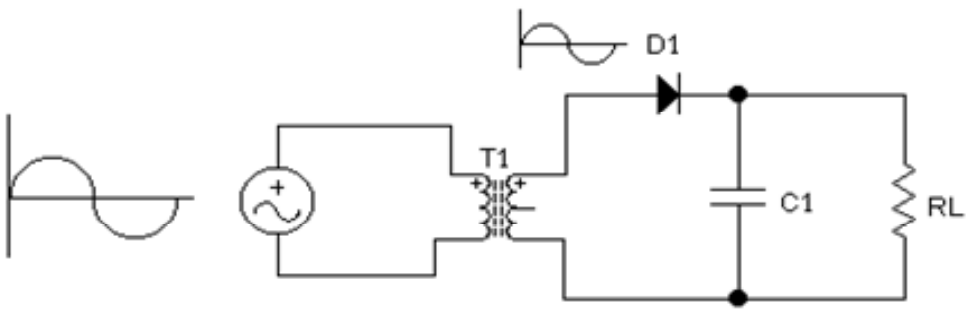
Micro farad, $\mu F = 10^{-6}$ F
Nano farad, $nF = 10^{-9}$ F
Pico farad, $pF = 10^{-12}$ F

Rectifiers

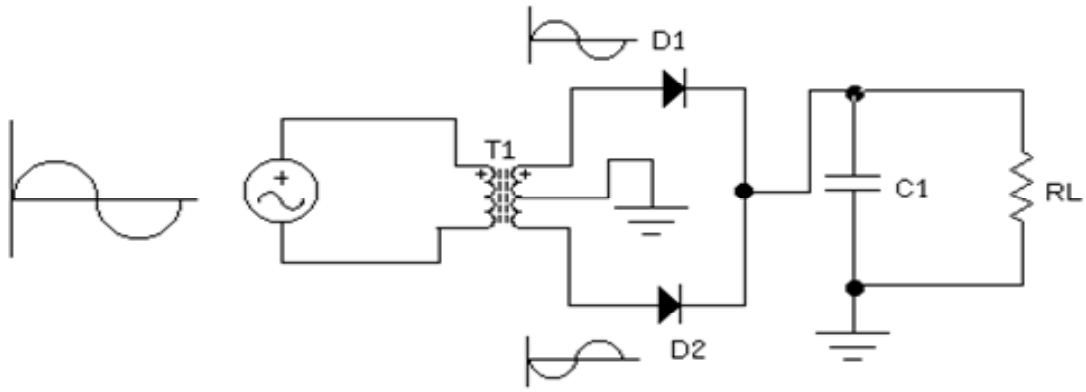
Half-Wave Rectifier

The AC source produces a sinusoidal voltage. Assuming an ideal diode, the positive half cycle of source voltage will forward-bias the diode. Since the switch is closed, the positive half cycle of source voltage will appear across the load resistor. On the negative half cycle, the diode is reverse-biased. In this case, the ideal diode will appear as an open switch, and no voltage appears across the load resistor. Thus a *unidirectional load current* is produced i.e. it flows in only one direction.

Full-

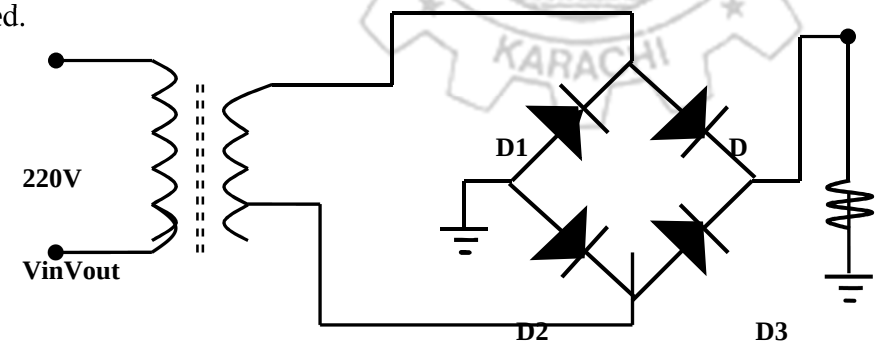


The *full-wave rectifier* is equivalent to two half-wave rectifiers. Because of the centre tap in transformer, each of these rectifiers has an input voltage equal to half the secondary voltage. Diode D_1 conducts on the positive half cycle, and diode D_2 conducts on the negative half cycle. The full-wave rectifier acts the same as two back-to-back half-wave rectifiers. During both half cycles, the load voltage has the same polarity and the load current is in the same direction. The circuit is called a *full-wave rectifier* because it has changed the A.C. input voltage to the pulsating D.C. output voltage.



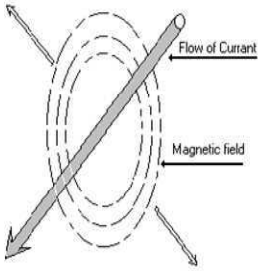
Bridge Rectifier

The *bridge rectifier* is similar to a full-wave rectifier because it produces a full-wave output voltage. Diodes D_1 and D_3 conduct on the positive half cycle, and D_3 and D_4 conduct on negative half cycle. As a result, the rectifed load current flows during both half cycles. During both half cycles, the load voltage has the same polarity and the load current is in the same direction. The circuit has changed the A.C. input voltgae to the plulsating D.C. output voltage. The advantage of using *Bridge Recitifer* over *Full-Wave Rectifieir* is that the entire secondary voltage can be used.



Inductance

When current flow through a wire it creates a magnetic field. This field grows outward from the center of the conductor as increases or collapse back into the center of the conductor. When current starts flowing, a magnetic field is created which grows outwards from the center of the conductor. When current decreases then the surrounding magnetic field starts to collapse back into the conductor.

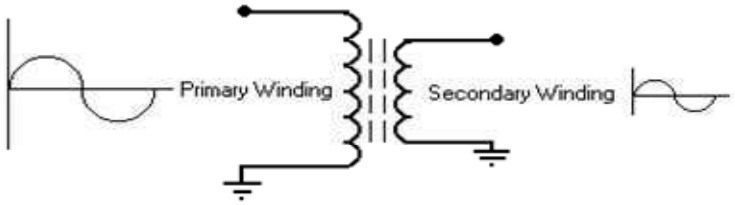


Transformers

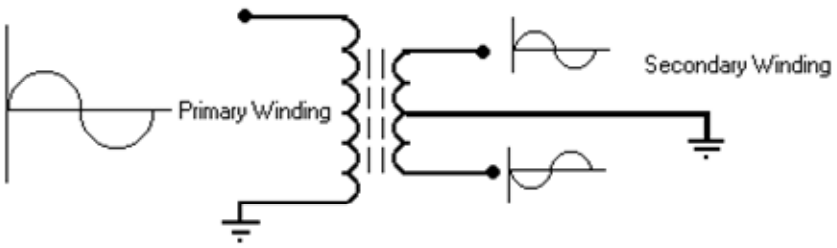
If two coils are wound close together so that they are 'magnetically coupled', then any changing currents in one coil will induce changing currents in the other. If changing voltage is fed across the input coil (the primary) then a similar changing voltage will appear across the output coil (the secondary) There is no physical connection between input coil (primary coil) and output coil (secondary coil) but these coil are connected through magnetic field.

If the primary and secondary winding have the same number of turns, then the output voltage must be similar to the input. It means output voltage depends on the ratio of input and output coils. If input coil has 100 number of turns and output coil has 10 number of turns, the ratio is 100/10, then output voltage must be ten time less than the input voltage.

The transformer, which is shown is single output transformer. For multiple outputs we use centre tape transformer as show in figure .



Transformer – Single output



Center tape Transformer

RESULT

1. Draw a full wave output diagram.

Lab Session 04

OBJECT

Designing Printed Circuit Boards.

THEORY

You've designed your circuit, perhaps even bread boarded a working prototype, and now it's time to turn it into a nice Printed Circuit Board (PCB) design. For some designers, the PCB design will be a natural and easy extension of the design process. But for many others the process of designing and laying out a PCB can be a very daunting task. There are even very experienced circuit designers who know very little about PCB design, and as such leave it up to the "expert" specialist PCB designers. Many companies even have their own dedicated PCB design departments. This is not surprising, considering that it often takes a great deal of knowledge and talent to position hundreds of components and thousands of tracks into an intricate (some say artistic) design that meets a whole host of physical and electrical requirements. Proper PCB design is very often an integral part of a design. In many designs (high speed digital, low level analog and RF to name a few) the PCB layout may make or break the operation and electrical performance of the design. It must be remembered that PCB traces have resistance, inductance, and capacitance, just like your circuit does.

The steps involved in PCB design can be listed here as under:

The Schematic

Before begin to lay out your PCB, you MUST have a complete and accurate schematic diagram. A PCB design is a manufactured version of your schematic, so it is natural for the PCB design to be influenced by the original schematic. If your schematic is neat, logical and clearly laid out, then it really does make your PCB design job a lot easier. Good practice will have signals flowing from inputs at the left to outputs on the right. With electrically important sections drawn correctly, the way the designer would like them to be laid out on the PCB. Like putting bypass capacitors next to the component they are meant for. Little notes on the schematic that aid in the layout are very useful. For instance, “this pin requires a guard track to signal ground”, makes it clear to the person laying out the board what precautions must be taken. Even if it is you who designed the circuit and drew the schematic, notes not only remind yourself when it comes to laying out the board, but they are useful for people reviewing the design. Your schematic really should be drawn with the PCB design in mind.

The schematics for PCB Design can be drawn with the help of available design aid software. The softwares that are mainly used for this purpose are orcad and workbench. You also learn in preceding lab session, how to design circuits with the help of these softwares.

Imperial and Metric

As any long time PCB designer will tell you, you should always use imperial units (i.e. inches) when designing PCBs. This isn't just for the sake of nostalgia, although that is a major reason! The majority of electronic components were (and still are) manufactured with imperial pin spacing. So this is no time to get stubborn and refuse to use anything but metric units, metric will make laying out of your board a lot harder and a lot messier.

Working to Grids

The second major rule of PCB design, and the one most often missed by beginners, is to lay out your board on a fixed grid. This is called a "snap grid", as your cursor, components and tracks will "snap" into fixed grid positions. Not just any size grid mind you, but a fairly coarse one. 100 thou is a standard placement grid for very basic through hole work, with 50 thou being a standard for general tracking work, like running tracks between through hole pads. For even finer work you may use a 25 thou snap grid or even lower. Many designers will argue over the merits of a 20 thou grid v/s a 25 thou grid for instance. In practice, 25 thou is often more useful as it allows you to go exactly half way between 50 thou spaced pads.

Why is a coarse snap grid so important? It's important because it will keep your components neat and symmetrical; aesthetically pleasing if you may. It's not just for aesthetics though - it makes future editing, dragging, movement and alignment of your tracks, components and blocks of components easier as your layout grows in size and complexity.

A bad and amateurish PCB design is instantly recognizable, as many of the tracks will not line up exactly in the center of pads. Little bits of tracks will be "tacked" on to fill in gaps etc. This is the result of not using a snap grid effectively.

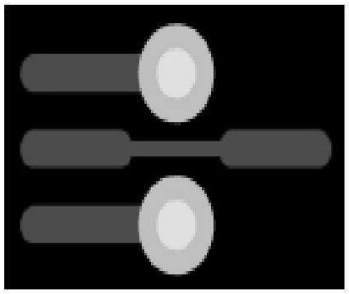
Tracks

There is no recommended standard for track sizes. What size track you use will depend upon (in order of importance) the electrical requirements of the design, the routing space and clearance you have available, and your own personal preference. Every design will have a different set of electrical requirements which can vary between tracks on the board. All but basic non-critical designs will require a mixture of track sizes. As a general rule though, the bigger the track width, the better. Bigger tracks have lower DC resistance, lower inductance, can be easier and cheaper for the manufacturer to etch, and are easier to inspect and rework.

Real world typical figures are 10/10 and 8/8 for basic boards. The IPC standard recommends 4 thou as being a lower limit. Once you get to 6thou tracks and below though, you are getting into the serious end of the business and you should be consulting your board manufacturer first. The lower the track/space figure, the greater care the manufacturer has to take when aligning and etching the board. They will pass this cost onto you, so make sure that you don't go any lower than you need to. As a guide, with "home made" PCB manufacturing

processeslike laser printed transparencies and pre-coated photo resist boards, it is possible to easily get 10/10 and even 8/8 spacing.

Changing your track from large to small and then back to large again is known as “necking”, or “necking down”. This is often required when you have to go between IC or component pads. This allows you to have nice big low impedance tracks, but still have the flexibility to route between tight spots.



The thickness of the copper on the PCB is nominally specified in ounces per square foot, with 1oz copper being the most common. You can order other thicknesses like 0.5oz, 2oz and 4oz. The thicker copper layers are useful for high current, high reliability designs.

Track Width Reference Table (for 10deg C temp rise). Track Width is in Thous (mils)			
Current (Amps)	**Width for 1oz**	**Width for 2 oz**	**milli Ohms/Inch**
1	10	5	52
2	30	15	17.2
3	50	25	10.3
4	80	40	6.4
5	110	55	4.7
6	150	75	3.4
7	180	90	2.9
8	220	110	2.3
9	260	130	2.0
10	300	150	1.7

Pads

Pad sizes, shapes and dimensions will depend not only upon the component you are using, but also the manufacturing process used to assemble the board, among other things. There is an important parameter known as the pad/hole ratio. This is the ratio of the pad size to the hole size. Each manufacturer will have his own minimum specification for this. As a simple rule of thumb, the pad should be at least 1.8 times the diameter of the hole, or at least 0.5mm

larger. This is to allow for alignment tolerances on the drill and the artwork on top and bottom layers. This ratio gets more important the smaller the pad and hole become, and is particularly relevant to vias.

There are some common practices used when it comes to generic component pads. Pads for leaded components like resistors, capacitors and diodes should be round, with around 70 thou diameter being common. Dual In Line (DIL) components like IC's are better suited with oval shaped pads (60 thou high by 90-100 thou wide is common). Pin 1 of the chip should always be a different pad shape, usually rectangular, and with the same dimensions as the other pins.

Most surface mount components use rectangular pads, although surface mount SO package ICs should use oval pads. Again, with pin 1 being rectangular. Other components that rely on pin numbering, like connectors and SIP resistor packs, should also follow the "rectangular pin 1" rule.Octagonal pads are seldom used, and should generally be avoided. As a general rule, use circular or oval pads unless you need to use rectangular.

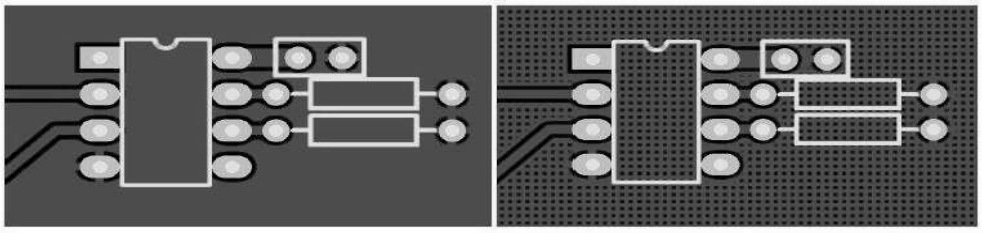
Vias

Vias connect the tracks from one side of your board to another, by way of a hole in your board. On all but cheap home made and low end commercial prototypes, vias are made with electrically plated holes, called Plated Through Holes (PTH). Plated through holes allow electrical connection between different layers on your board.

Holes in vias are usually a fair bit smaller than component pads, with 0.5-0.7mm being typical.Using a via to connect two layers is commonly called "stitching", as you are effectively electrically stitching both layers together, like threading a needle back and forth through material.

Polygons

"Polygons" are available on many PCB packages. A polygon automatically fills in (or "floods") a desired area with copper, which "flows" around other pads and tracks. They are very useful for laying down ground planes. Make sure you place polygons after you have placed all of your tacks and pads.Polygon can either be "solid" fills of copper, or "hatched" copper tracks in a crisscross fashion. Solid fills are preferred, hatched fills are basically a thing of the past.



An example of a "Solid Polygon Fill" (Left), and a "Hatched Polygon Fill" (Right)

Clearances

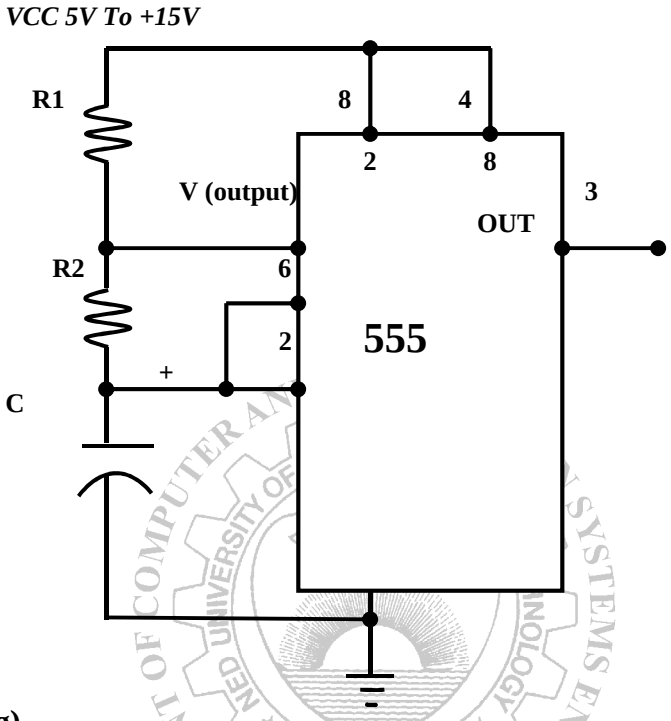
Electrical clearances are an important requirement for all boards. Too tight a clearance between tracks and pads may lead to "hairline" shorts and other etching problems during the manufacturing process. These can be very hard to fault find once your board is assembled.

For 240V mains on PCB's there are various legal requirements, and you'll need to consult the relevant standards if you are doing this sort of work. As a rule of thumb, an absolute minimum of 8mm (315 thou) spacing should be allowed between 240V tracks and isolated signal tracks. Good design practice would dictate that you would have much larger clearances than this anyway.For non-mains voltages, the IPC standard has a set of tables that define the clearance required for various voltages. A simplified table is shown here. The clearance will vary depending on whether the tracks are on an internal layers or the external surface. They also vary with the operational height of the board above sea level, due to the thinning of the atmosphere at high altitudes. Conformal coating also improves these figures for a given clearance, and this is often used on military spec PCBs.

Clearances for Electrical Conductors			
Voltage (DC or Peak AC)	**Internal**	**External (<3050m)**	**External (>3050m)**
0-15V	0.05mm	0.1mm	0.1mm
16-30V	0.05mm	0.1mm	0.1mm
31-50V	0.1mm	0.6mm	0.6mm
51-100V	0.1mm	0.6mm	1.5mm
101-150V	0.2mm	0.6mm	3.2mm
151-170V	0.2mm	1.25mm	3.2mm
171-250V	0.2mm	1.25mm	6.4mm
251-300V	0.2mm	1.25mm	12.5mm
301-500V	0.25mm	2.5mm	12.5mm

Demonstrating PCB

You have already implemented the circuit mentioned below using breadboard / veroboard in previous lab session. We are going to implement the very same circuit with PCB in this lab session.



Patterning (etching)

The vast majority of printed circuit boards are made by bonding a layer of copper over the entire substrate, sometimes on both sides, (creating a "blank PCB") then removing unwanted copper after applying a temporary mask (e.g. by etching), leaving only the desired copper traces. A few PCBs are made by *adding* traces to the bare substrate (or a substrate with a very thin layer of copper) usually by a complex process of multiple electroplating steps. The PCB manufacturing method primarily depends on whether it is for production volume or sample/prototype quantities.

Circuit Schematics Imprint

The print of the circuit depends on the requirement which can be categorized as follow:

- Commercial
  - silk screen printing–the main commercial method
  - Photographic methods–used when fine line widths are required

- Non Commercial
  - Laser-printed resist: Laser-print onto paper

- Print onto transparent film and use as photo mask along with photo-sensitized boards.
- Laser resist ablation: Spray black paint onto copper clad laminate, place into CNC laser plotter. The laser raster-scans the PCB and ablates (vaporizes) the paint where no resist is wanted.
- Use a CNC-mill with a spade-shaped (i.e. 45-degree) cutter or miniature end-mill to route away the undesired copper, leaving only the traces.
- By using a liquid proof marker that draws tracks on the copper sheet, leaving only the region required for conducting purpose and afterwords performing chemical etching to convert remaining portion as insulator. (The method we are going to use in this lab session)

Chemical etching

Chemical etching is done with ferric chloride, ammonium persulfate, or sometimes hydrochloric acid. For PTH (plated-through holes), additional steps of electroless deposition are done after the holes are drilled, then copper is electroplated to build up the thickness, the boards are screened, and plated with tin/lead. The tin/lead becomes the resist leaving the bare copper to be etched away.The simplest method, used for small scale production and often by hobbyists, is immersion etching, in which the board is submerged in etching solution such as ferric chloride. Compared with methods used for mass production, the etching time is long. Heat and agitation can be applied to the bath to speed the etching rate.

Lamination

Some PCBs have trace layers inside the PCB and are called *multi-layer* PCBs. These are formed by bonding together separately etched thin boards.

Drilling

Holes through a PCB are typically drilled with small-diameter drill bits made of solid coated tungsten carbide. Coated tungsten carbide is recommended since many board materials are very abrasive and drilling must be high RPM and high feed to be cost effective. Drill bits must also remain sharp to not mar or tear the traces. Drilling with high-speed-steel is simply not feasible since the drill bits will dull quickly and thus tear the copper and ruin the boards. The drilling is performed by automated drilling machines with placement controlled by a *drill tape* or *drill file*. These computer-generated files are also called *numerically controlled drill* (NCD) files or "Excellon files". The drill file describes the location and size of each drilled hole. These holes are often filled with annular rings (hollow rivets) to create vias.

Exposed conductor plating and coating

PCBs are plated with solder, tin, or gold over nickel as a resist for etching away the unneeded underlying copper.After PCBs are etched and then rinsed with water, the soldermask is

applied, and then any exposed copper is coated with solder, nickel/gold, or some other anti-corrosion coating.

Solder resist

Areas that should not be soldered may be covered with a polymer *solder resist* (*solder mask*) coating. The solder resist prevents solder from bridging between conductors and creating short circuits. Solder resist also provides some protection from the environment. Solder resist is typically 20–30 micrometres thick.

Test

Unpopulated boards may be subjected to a *bare-board test* where each circuit connection (as defined in a *netlist*) is verified as correct on the finished board. For high-volume production, a Bed of nails tester, a fixture or a Rigid needle adapter is used to make contact with copper lands or holes on one or both sides of the board to facilitate testing. A computer will *instruct* the electrical test unit to apply a small voltage to each contact point on the bed-of-nails as required, and verify that such voltage appears at other appropriate contact points. A "short" on a board would be a connection where there should not be one; an "open" is between two points that should be connected but are not.

Printed circuit assembly

After the printed circuit board (PCB) is completed, electronic components must be attached to form a functional *printed circuit assembly*, or PCA (sometimes called a "printed circuit board assembly" PCBA). In *through-hole* construction, component leads are inserted in holes. In *surface-mount* construction, the components are placed on *pads* or *lands* on the outer surfaces of the PCB. In both kinds of construction, component leads are electrically and mechanically fixed to the board with a molten metal solder.

EXERCISES

1. How you can differ PCB designing from other assembling projects?

_____
_____
_____
_____
_____
_____

2. What sort of unit system is preffered in PCB designing, Imperial or Metric? What do you understand by the term “thou”?

_____
_____

3. Discuss briefly the concept of "necking"

4. What are Vias? How they help connecting two different layers? Is there any difference between vias and pads?

5.In this exercise you have to mention each and every step taken by you to fabricate the PCB for the timer circuit given in this labs session Did you follow all the necessary steps mentioned in this lab session for the fabrication? If not then mention why?

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY
KARACHI
DEPARTMENT OF COMPUTER AND INFORMATION SYSTEMS ENGINEERING

Lab Session 5

OBJECT

Studying basics behind the construction of a power supply.

THEORY

Current

A flow of electric charge or the charge flowing per second is called *Current*(I). It is measured in Amperes (A) – Electric current is carried either by the flow of negatively charged electrons, or of positively charged ions, or, in semiconductors, by positive holes where electrons are missing from a crystal structure.

Types of Current

There are two types of current.
1. Direct Current (called DC)
2. Alternating Current (called AC)

Direct Current

A direct current (DC) is a steady electric current (stream of electrons) flowing in one direction, as opposed to an alternating current, which reverses direction periodically. Direct current is produced by simple batteries in cassette players, flashlights, and toys. The main applications of direct current are in the fields of electronics, traction (battery-powered vehicles and some electric trains), and electrochemical processing. Alternating current in the form of mains electricity is often converted into direct current inside electrical appliances, particularly if they contain electronic components.

Alternating Current

An alternating current (AC) regularly reverses its direction – the electrons that make up the current constantly change their direction of movement. Alternating current is used almost universally in mains electricity supplies, in which it reverses direction with a set frequency (for example, mains electricity in Europe and Asia, including Pakistan has a frequency of 50 Hz, while in Canada and the United States, it has a frequency of 60 Hz). Its advantage over direct current is that the voltage may be easily increased ("stepped up") or decreased ("stepped down)" using a transformer according to need. High voltages are used to generate and transmit electricity to our homes, because this helps to reduce the energy lost in the process.

Capacitor Input Filter

The *capacitor input filter* produces a D.C. output voltage equal to the peak value of the rectified voltage. This type of filter is the most widely used in power supplies. Other type of filter is *choke input filter* which is not used due to its high cost and weight.

Initially, the capacitor is uncharged. During the first quarter cycle the diode is forward biased. Since it ideally acts like a closed switch the capacitor charges and its voltage equals the source voltage at each instant of the first quarter cycle. The charging continues until the input reaches its maximum value. At this point, the capacitor voltage equals the peak value of the rectified voltage.

After the input voltage reaches the peak, it starts to decrease. As soon as the input voltage is less then the peak value, the diode turns off. In this case, it acts like the open switch. During the remaining cycle, the capacitor stays fully charged and the diode remains open. This is why output voltage is constant and equal to the peak value.

Transformers

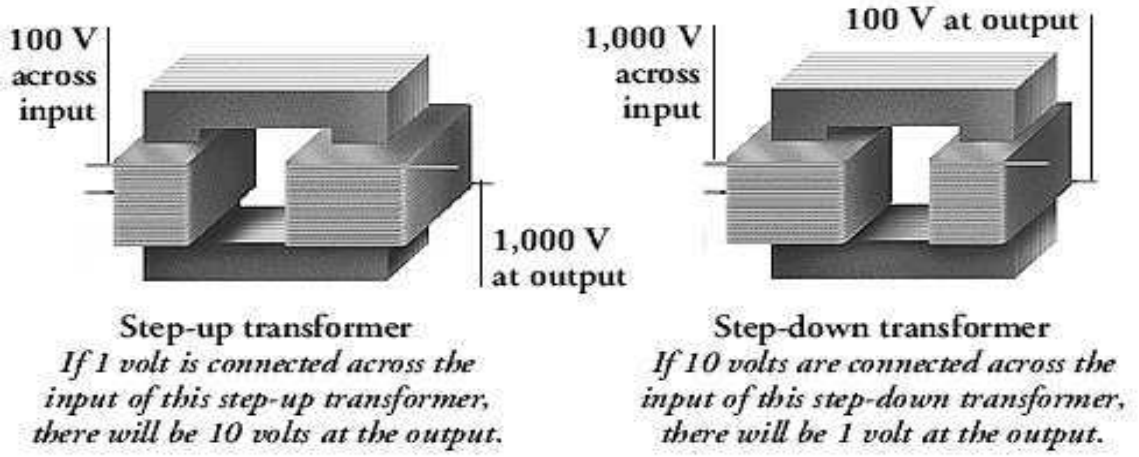
A transformer is two coils of wire (called the primary coil and the secondary coil) wrapped around a piece of iron. It makes AC voltages larger or smaller, depending on how the coils are arranged.

Step-Up and Step-Down Transformers

A transformer with more windings in the secondary coil than in the primary increases voltage and is called a step-up transformer. The reverse arrangement, a step-down transformer, decreases voltage.
Mathematically, $V_s / V_p = N_s / N_p$

Voltage in secondary coil / voltage in primary coil = number of coils in secondary coil / number of coils in primary coil.

A transformer works because the alternating voltage carried in one coil induces an alternating voltage in the other coil. This is called mutual inductance.


100 V
across
input
1,000 V
at output
Step-up transformer
If 1 volt is connected across the input of this step-up transformer, there will be 10 volts at the output.
1,000 V
across
input
100 V at output
Step-down transformer
If 10 volts are connected across the input of this step-down transformer, there will be 1 volt at the output.

The coils, or windings, are not connected electrically, but they are linked magnetically. The two windings have at least some magnetic flux (magnetic field lines) common to both. If one winding (the primary) is connected to an AC supply, the current produces an alternating magnetic flux in the core which induces an electromotive force (emf) in the other winding (the secondary).

Regulating ICs

Regulating ICs consist of Zener Diodes, which have fixed output voltage even though the current through it changes. The Zener Diode is got to be reverse biased for normal operation.

Working

The circuit functions in the following steps:
1. Stepping Down of A.C. Signal
2. Rectification
3. Filtration
4. Regulation

1. Stepping Down of A.C. Signal

The power supply is connected with an A.C. source of 220 V. The current is allowed to flow to the step-down transformer via the on-off switch and a 2 A fuse. The transformer changes the 220 V signal at input into a 14 V signal at output. The transformer works on the principal of mutual inductance. According to which, if two coils are wound close together so that they are 'magnetically coupled', then any changing currents in one coil will induce changing currents in the other. If changing voltage is fed across the input coil (the primary) then a similar changing voltage will appear across the output coil (the secondary). There is no physical connection between input coil (primary coil) and output coil (secondary coil) but these coils are connected with magnetic field. The coil with the most turns corresponds to the higher voltage in the transformer. To step down from a high voltage to a lower one, the primary coil must have more windings than the secondary.

2. Rectification

The current is then allowed to pass through the bridge-rectifier (made by using four 1N4001 diodes). The diode bridge rectifies the A.C. signal into a pulsating D.C. form. During the positive half cycle diodes D_1 and D_3 conducts the current in the positive direction while during the negative half cycle the gets reverse biased and hence stops the flow of current. On the other hand diodes D_2 and D_4 conducts during the negative half cycle. This pulsating D.C. is then allowed to pass through the capacitor for filtration.

3. Filtration

The pulsating D.C. is filtered by using a 2200 µF-35V capacitor (to make it more manageable for the regulator) and thus we get a pure D.C. During the first quarter cycle the rising voltage charges the capacitor and when the voltage starts to reduce the capacitor starts to discharge and thus a stabilized D.C. voltage is obtained.
Although the D.C. obtained is almost a pure one, but it may contain some ripples. Thus one more capacitor (of 0.1 µF) is used. This capacitor further filters the D.C. voltage and thus a pure D.C. is obtained. This pure D.C. is then fed to the regulating ICs of Model 7812 and 7805.

4. Regulation

The regulators have fixed outputs i.e. output of *Regulator 7812* is +12 V whereas that of *Regulator 7805* is +5 V. The output obtained from these regulating ICs may contain some ripples therefore, these outputs are further filtered by using capacitors of 100 µF - 25 V and 100 µF - 16 V respectively.

EXERCISES

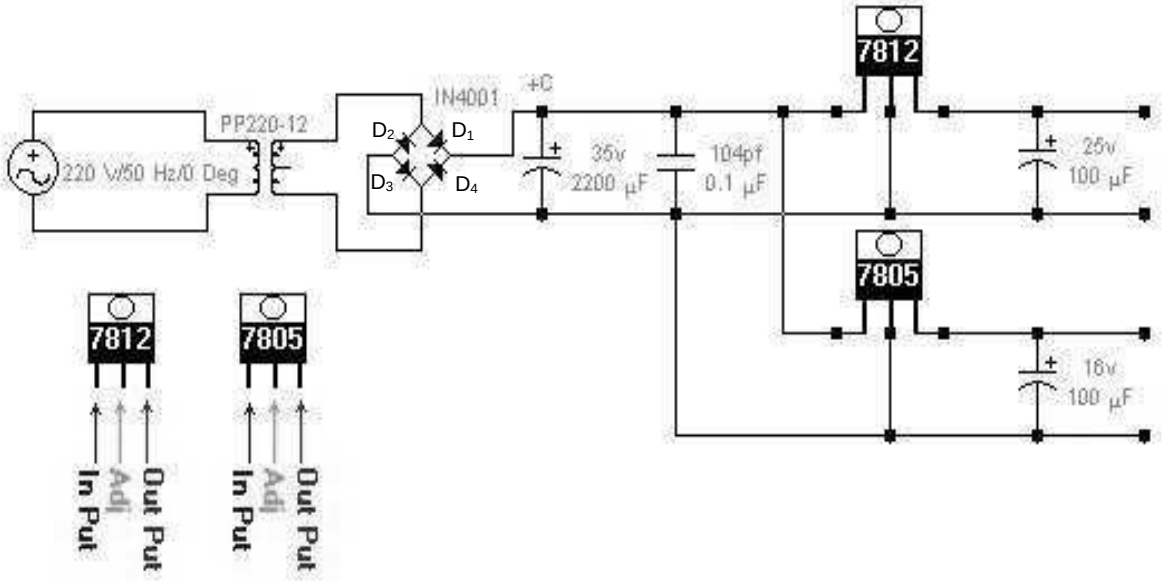
Construct a power supply with two D.C. outputs i.e. 12 Volts and 5 Volts.

Components Required

Component	***Quantity***
Transformer - Input 220 V Output 14 V, 2A	1
Diode - Model: IN4001	4
Capacitor - 2200 µF, 35 V	1
Capacitor - 0.1 µF/104 *p*F	1
Capacitor - 100 µF, 25 V	1
Capacitor - 100 µF, 16 V	1
Regulator - 7812 (for 12 V output)	1
Regulator - 7815 (for 5 V output)	1

Bread Board	1
Banana Jacks	2 Sets (2 Black & 2 Red)
Fuse Holder	1
Fuse 220 V, 2 A	1
On – Off Switch with Indicator	1
Plug, Cord & Casing	1

Circuit Diagram



RESULT

Section Two:

Introduction to MS Office and Operating System

Lab Session 06

OBJECT

Learning features of Microsoft Word & Microsoft Excel

WORD PROCESSING CONCEPTS

Indentation

To indent both the left and right sides of the paragraph, position the insertion point in the paragraph to be indented, or select multiple paragraphs to indent; Choose Format, Paragraph, the Paragraph dialog box is displayed; click the Indents and Spacing tab if it is not selected; Type or select a value in the Left and then the Right indentation text boxes. Click OK to apply the indentation to the paragraph(s). To modify block style for letters or documents, in the Special list box, select the desired option; type or select a value in the By box. Click OK to apply the indentation to the paragraph(s).

Alignment: Aligning Text

Word automatically aligns text on the left margin (horizontal alignment) and to the top margin (vertical alignment). The user can choose to change the alignment to center, right, full justified, or back to left. To change horizontal alignment, select the paragraph(s) to be changed; Press Ctrl+L (Left), Ctrl+E (Center), Ctrl+R (Right), or Ctrl+J (Justify) to change the alignment of the paragraph accordingly (or use the Align Left, Center, Align Right, or Justify buttons on the Standard toolbar).

Columns

To create columns of equal width, switch to Page Layout View (click the Page Layout View button at bottom left of the document window); Select the text (or to format the entire document with columns, select the document); On the Standard toolbar, click the Columns button; Drag the pointer to select the number of columns needed. Or for more customization, select the text to be formatted into columns (or to format the entire document with columns, select the document); Choose Format, Columns to display the Columns dialog box; Click the desired options. To remove columns, select the text for the columns to be removed; Click the Columns button on the Standard toolbar and select one column.

Customizing Paragraph Spacing

The user can customize the paragraph spacing in Word for the spacing between paragraphs and the spacing between the lines in specified paragraphs. To do this, place the insertion point in the paragraph to be modified, or highlight all of the contiguous paragraphs to be changed; Choose Format, Paragraph to display the dialog box, then click the Indents and Spacing tab if it is not active; In the Spacing section, select Before and After and change the

value(s) in the text box to increase or decrease by points the number of lines before or after a paragraph (6 points = 1 line); To change the line spacing within paragraphs, select the drop-down arrow for the Line Spacing list box, then select one of these options: 1.5 lines, Double, At least, Exactly, or Multiple; If one of the last three options is chosen, enter a number in the At text box. When finished, choose OK.

Creating Headers and Footers

Headers and footers contain information repeated at the top or bottom of the pages in a document. To set Header and Footer, with the document open, choose View, Header and Footer to display the Header pane in the document; Type and format the information for the header; To include the Page Number, Number of Pages, or current Date or Time, click the corresponding button on the Header and Footer toolbar; To create a footer, click the Switch Between Header and Footer button on the toolbar and type and format the footer just as did for the header. Click Close to return to the document.

Graphs

To insert a graph, position the insertion point where the chart is to be appeared. Choose Insert, Object to open the Object dialog box. Click the Create New tab and in the Object Type box, select Microsoft Graph Chart. Float Over Text is the default. If prefer, click Display as Icon. Choose OK; Microsoft Graph opens showing a datasheet with sample data in it. This overlays the Word document which now displays a graph of that sample data at the insertion point. It is surrounded by a box with eight *handles* indicating it is selected. At the same time, the Microsoft Graph Standard and Formatting toolbars appear at the top of the document window; Click in the cells of the datasheet or use the Tab key to navigate from cell to cell, entering data to suit the needs

Drawing Tables/Converting Table to Text

Drawing a table allows the user to place the rows and columns where he wants them. To create a table, click the Tables and Borders button to bring up the Tables and Borders toolbar and change the mouse pointer to a pencil; Drag the mouse pointer from one corner of the new table to the opposite corner to create the rectangle outline for the table; If a line is to be removed, click the Eraser button on the Tables and Borders toolbar and drag across the line. If the user needs the data from a table, he may (rarely) want to convert the table to text with some sort of separator between the data for the former columns. To do this, select the entire table by positioning the mouse directly above the top of the table until the pointer changes to a black down arrow, then click and drag the mouse across all the columns. Choose Table, Convert Table to Text; In the Convert Table to Text dialog box, choose to separate the text with Paragraph Marks, Tabs, Commas, or type a new character in the Other text box; then choose OK. Similarly the user may want to convert the lines of text into a table. To do this, select the rows of tabbed text to be converted; Click the Insert Table button on the Standard toolbar.

Paragraphs: Formatting Line and Page Breaks

The Line and Page Breaks tab on the Format Paragraphs dialog box gives detailed control. The user would not want to have one line of a paragraph appear on the bottom or top of a page alone. This is Widow and Orphan control. Keep Lines Together will not allow a page break anywhere within the paragraph. Keep with Next will prevent a page break between the selected paragraph and the following paragraph. Page Break Before will insert a manual page break before the selected paragraph.

Sections Breaks

Section breaks are important when the user need to apply different formatting choices to different parts of the document. To insert Section Breaks, position the insertion point where the section break is required, and then choose Insert, Break to display the Break dialog box; Select one of the Section Break options listed in the table following these steps; Choose OK to return to the document. Different options are: Next Page-to start section at the top of the next page in the document; Continuous-to start section at the insertion point (for varying columns on one page); Even Page-to start section on next even-numbered page in the document (most often a left-facing page); Odd Page-to start section on next odd-numbered page in the document (most often a right-facing page).

Page Setup

Changing the default page layout formatting enables the user to choose whether the headers and footers are the same throughout the document, or change from odd page to even page. To change layout, choose File, Page Setup to display the Page Setup dialog box, then select the Layout tab; In the Section Start drop-down list, select from where the new sections are to be started; In the Headers and Footers section, click one of the options: Different Odd and Even or Different First Page, depending on the needs for the headers and footers in the document; Select the Vertical Alignment drop-down arrow to choose between Top, Center, or Justified; In the Apply To box, indicate to what portion of the document these changes are to be applied, then choose OK.

Hyperlinks

The user can create a link that jumps to a document, also called a page, on his computer and on a network or intranet. Two types of hyperlinks can be created. one that jumps to a bookmark in the same document and another that jumps to a URL.First type is for named locations. Named locations can be in the same document the user is working with (an internal link), or in a different document (an external link). Second type is for URLs and other links. For this **c**lick the Insert Hyperlink button on the Standard toolbar to open the Insert Hyperlink dialog box; In the Link to File or URL text box, click the upper Browse button to locate and select the document. The path and document name are automatically entered in the Link to File or URL text box; choose OK to confirm the choice or Cancel to negate it.

Mail Merge

If the user is sending many documents, mail merge can save lots of time. The user can design a form that prints multiple labels on a page similar to the way he designs a form letter.

- Creating Main Document - A main document is a letter, envelope, or other document that has text that the user wants to appear on every merge, and codes that will be replaced with entries from a data source of names and addresses.

  To create the main document, open the existing document to be used, or a new blank document window. Then choose Tools, Mail Merge to display the Mail Merge Helper; Click the Create button under Step 1 Main document, then select Form Letters; Word will give a choice to use the Active Window, which is the document window that is open behind the dialog box. Or, start a New Main Document, which will open a new blank document window; Word takes back to the Mail Merge Helper dialog box, which now displays the type of merge and the name and path of the document under the Main Document step; Now choose Get Data under Step 2.

- Opening a Existing Data Source - The existing data source could be a Word document, an Excel document, an Access database or query, a dBASE file, or even a FoxPro file, as well as many others. For this, in Get Data under Step 2, while creating the main document, on the dialog box, choose Open Data Source to display the Open Data Source dialog box; Word can read many different data source formats. Choose the drop-down arrow on the Files of Type list to select the file type for the data source; Navigate in the Look In list to find the drive and folder where the data source file is stored. Select the file and choose Open, or if available, click the MS Query button if a non-Word database is to be selected; When prompted that Word found no merge fields in the main document, choose the Edit Main Document button to insert merge fields into the main document.

- Creating Data Source - If the user does not have a data source that contains list of names and addresses for the merge document, one can be created using the Mail Merge Helper. Address information from Outlook and Schedule+ can also be used.

  To do this, in Get Data under Step 2, while creating the main document, on the dialog box, choose Create Data Source to display the Create Data Source dialog box; Scroll through the list of fields in the Field Names in Header Row list box to see commonly used field names provided by Word; Edit the list of field names using the list following these steps and when finished, choose OK; Word displays the Save As dialog box. In the File Name box, enter a name for the data source document and choose Save; Word displays a decision box; choose Edit Data Source to enter information into the data source file just created, or choose Edit Main Document to insert merge fields into the main document.

  Field names can also be changed through various options. Select the field name which is not required from the list, then choose the Remove Field Name button; To add a field name that isn't listed, type the name in the Field Name text box, then choose Add Field Name; To change the sequence of field names, select a field name in the Field Names in

Header Row list box, then click the up-arrow or down-arrow buttons. The top-to-bottom order of the fields is the order the fields will be in for data entry in the data source.

- Entering Data - After the user has created a data source, he will need to enter information into the source and edit existing information. If the data source is created in an application other than Word, follow the procedures for entering and editing in the source application. If, on the other hand, the source has been created in Word using the Mail Merge Helper, follow the instructions given below.

- Inserting Fields - Once the user has attached a data source for the mail merge, he is ready to insert merge fields in the main document. Merge fields are the variable information that changes for each document. For this, if the main document is not opened with the Mail Merge toolbar displayed, click the Mail Merge Helper button on the toolbar. Click Edit under Step 1 Main Document, and then select the main document from the displayed list; Position the insertion point where a merge field is to be appeared. Click the Insert Merge Field button on the Mail Merge toolbar, and then select the field from the list presented; Type any text or punctuation that is needed in the document and continue inserting merge fields where necessary.

Microsoft Excel

Entering Formulas

Formulas enable the user to perform calculations by using values in the worksheet. Arithmetic operators that can be used in formulas include + for addition, - for subtraction, * for multiplication, / for division, % for percentage, and ^ for exponentiation. For example : =a1+b1 adds the contents of a1 and b1 in the cell where the formula is typed.To reference cells in other Worksheets, select the cell where the formula is to be appeared , and type an equal sign (=) to start the formula; Click the sheet tab containing the cell to be referenced in the formula; Select the cell or range to be referred to. The complete reference appears in the formula bar; Finish the rest of the formula; then press Enter to complete the formula.

Excel also provides functions like SUM, AVERAGE, etc.

- SUM: Adds all the numbers in a range of cells.
  Syntax: =SUM(number1, number2, …..)

AVERAGE: Returns the average (arithmetic mean) of the arguments.
Syntax: =AVERAGE(number1, number2, …..)

- COUNT: Counts the number of cells that contain numbers and numbers within the list of arguments.
  Syntax: =COUNT(value1, value2, …..)
- COUNTA: Counts the number of cells that are not empty and the values within the list of arguments.
  Syntax: =COUNTA(value1, value2, …..)
- PRODUCT: Multiplies all the numbers given as arguments and returns the product.
  Syntax: =PRODUCT(number1, number2, …..)
- SUMIF: Adds the cells specified by a given criteria.
  Syntax: SUMIF(range, criteria, sum_range)

Where 'Range' is the range of cells to be evaluated according to the given criteria. 'Criteria' is the criteria in the form of a number, expression, or text that defines which cells will be added. 'Sum_range' are the actual cells to sum. The cells in sum_range are summed only if their corresponding cells in range match the criteria. If sum_range is omitted, the cells in range are summed.

For example: Suppose B1:B4 contain the values 100, 200, 300, and 400 respectively. C1:C4 contains 1, 4, 6, and 2 respectively. Now the expression SUMIF(B1:B4,">275",C1:C4) will add 6 and 2 as there corresponding values in cells B3 and B4 are greater than 275. Hence the result will be 8. If sum_range argument is omitted then the result becomes 700.

- FACT: gives factorial of a number
  Syntax: FACT(num)
- Large: returns kth largest value
  Syntax: Large (Array, K)
- SMALL: returns kth smallest value
  Syntax: small(array, k)
- Ceiling: returns nearest kth value integer

Formulas: Absolute, Relative, and Mixed Cell References

When a cell contains a formula with references to other cells, several methods can be used to handle those references.Excel normally uses relative references for cell addresses in a formula, unless specified otherwise. When relative references are used, the cell references in a formula automatically adjust after the formula is copied to another cell or range. If cell B10 contains the formula =SUM(B3:B9), for example, and user copies this formula from cell B10 to cell C10, the new formula in cell C10 automatically adjusts to read =SUM(C3:C9).

Creating a Text String

At times, the user may need to create a formula that joins the contents of two cells. Excel refers to this action as concatenation. For example: If a worksheet includes first names in column B3 and last names in column C3, the user can enter a formula in a third column that joins the first name with the last name:
=B3&" "&C3 where ampersand (&) is the concatenation operator and (" ") simply indicates a space between the two text strings.

Displaying Formula Instead of Results

From anywhere in the worksheet, choose Tools, Options; then click the View tab; Select the Formulas check box; then click OK. To display the results again, choose Tools, Options; then clear the Formulas check box on the View tab. Press Ctrl+ ' (the grave accent, usually located on the same key as the tilde character) to toggle between viewing results and formulas.

AutoCalculate

Select the range to be summed. The AutoCalculate button in the status bar automatically displays the sum of the selected range (or right click the AutoCalculate button to see more functions); Right-click the AutoCalculate button in the status bar; From the pop-up menu that appears, select the function to be used, such as Average or Count. The result of the function selected appears in the status bar.

Logical Functions

The logical functions enables the user to add decision-making and logical tests to the worksheets. The IF statement is useful for testing conditions and making decisions based on a cell's contents. The AND and OR functions can test multiple criteria or test conditions for use in IF functions. The following examples show the use:

- =AND(D15,G23<30) result is TRUE only when D15 is not zero and G23 is less than 30
- =IF(AND(D17>10,D17<30),"Valid","Invalid") returns Valid if the contents of cell D17 is greater than 10 and less than 30; otherwise the formula returns Invalid
- =IF(NOT(OR(D17=10,D17=30)),"Not 10 or 30","Contains 10 or 30") tests whether cell D17 contains the result 10 or 30 and produces the message Not 10 or 30 when the cell does not contain either of those results; otherwise, the formula result is Contains 10 or 30
- =IF(OR(D17=10,D17=30),"Contains 10 or 30","Not 10 or 30") tests whether cell D17 contains the result 10 or 30 and produces the message Contains 10 or 30 when it does; otherwise, the formula produces the message Not 10 or 30

Math and Trigonometric Functions

Like logical functions, math and trigonometric functions can also be used in the Worksheets. Trigonometric functions use angles measured in radians. Following are some examples:

- =ABS(A10) returns 18 when cell A10 contains -18
- =ACOS(0.5) returns 1.047198 (radians)
- =DEGREES(0.5) returns 28.64789 (degrees)
- =LOG(12,3) returns 2.26186
- =ROUND(102.927,2) returns 102.93

Statistical Functions

Similarly, statistical functions can als0 be used in the Worksheets. For example:

- =COUNTIF(B1:B4,">100") returns 1 if the range B1:B4 contains the numbers 57, 102, 84, and 98
- =MEDIAN(1,4,2,6,9) returns 4
- =MEDIAN(1,4,2,6,9,10) returns 5 (average of the two middle values, 4 and 6)

EXERCISE

- Write a report of not more than two pages, on different types of computer systems namely microcomputers, minicomputers, mainframes, super computers. The report should be properly formatted with appropriate indentations, and font styles with single line spacing and the specified alignment : 1 cm from left, 1 cm from top. You may use additional styles like drop cap and columns. Include your name and roll number in the header field. Also, the total market in 1985 for the products and services of the top 100 companies in the computing industry is given below as percentages. Present this information in graphical form.
  Microcomputers - 10.18% ; Minicomputers - 11.18% ; Mainframes - 6.8% ;
  Data communications - 7.46% ; Peripherals - 27.23% ; Software - 7.63% ;
  Services - 5.72% ; Maintenance - 11.56% ; Other - 2.19%

- Create a word document, using mail merge wizard, which produces individual information reports for a list of students in the form of a table, including their first name, last name, father's name, home address, phone number, email addresses, and home page address as hyperlinks (if any). Enter few sample records. Table should be properly formatted. Remember to include your name and roll number in the header field. Get a printout to be attached here, of the page that contains only field name and not any records. Also attach 1 sample report containing actual data.

- Draw the sine (sin θ) and cosine (cos θ) wave on a single graph and format the graph accordingly. Take θ from 0° to 360° with the interval of 15°. Also Compare the values of sin and cos and tell at which angle these values are equal.

- Create a magic square puzzle as per given example below, the sum of all the numbers in a row must be equal, simultaneously the sum of all the numbers in a column must be equal, and the sum of diagonal numbers should also be equal:

12	3	9	24
5	8	11	24
7	13	4	24
24	24	24	24

WELL DONE!!!

Take the input from the user in all the squares. For a user all the squares will be blank initially and the box given below will contain the text "KEEP TRYING" unless the user enters all correct entries. If user solve the puzzle correctly then a message "WELL DONE" appears below. Format your work accordingly.

Lab Session 07

OBJECT

Familiarization with the environment of Microsoft Power Point.

USING POWER POINT

A user can communicate information better and more easily with a PowerPoint presentation. A presentation is a series of slides that a user creates by using PowerPoint. The more important the message, the clearer the presentation should be. Also for larger audience, the message must be easy to grasp.

The facilities PowerPoint provides are discussed below:

Creating a New Power Point Presentation

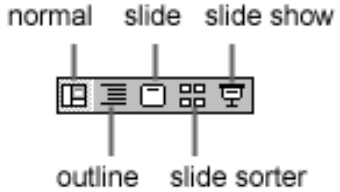
Presentation Type: Open Power Point and you will be prompted by a dialog box with different choices. These choices are explained below. If Power Point is already open or this box does not appear, select *File|New* from the menu bar.

- *AutoContent Wizard:* The AutoContent Wizard provides templates and ideas for a variety of presentation types. Page through the wizard by clicking the Next button on the bottom of each page after making necessary choices.
- *Design Template:* Power Point provides many templates with different backgrounds and text formatting to begin your presentation. Preview each design by highlighting the template name on the list. Press OK after you have chosen the design.
- *Blank Presentation:* Select Blank Presentation to build the presentation from scratch with no preset graphics or formatting.
- *Open an Existing Presentation:* Select this option to open a Power Point presentation that already exists. Select the folder the file is located in from the Look in: drop-down menu and highlight the file on the list. Click Open to open the presentation.

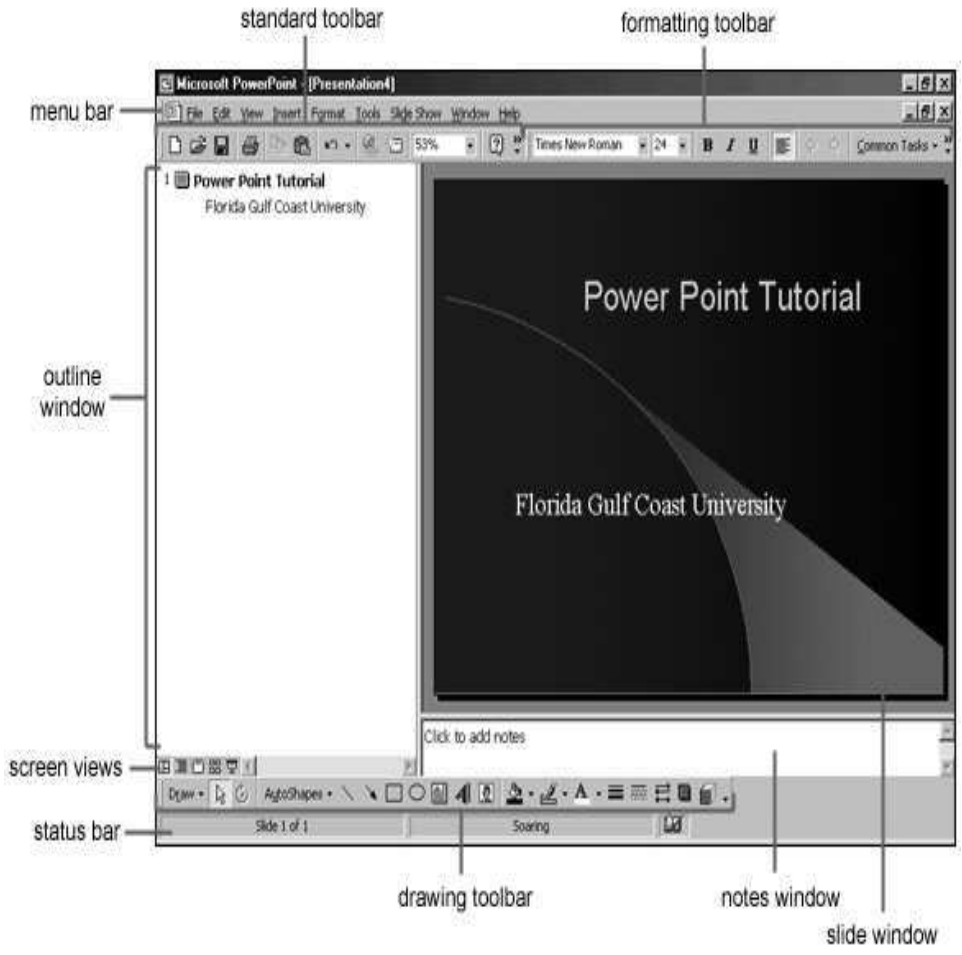
AutoLayout: After selecting the presentation type, you will be prompted to choose the layout of the new slide. These layouts include bulleted lists, graphs, and/or images. Click on each thumbnail image and a description will be printed in the message box. Highlight the layout you want and click *OK*.

Screen Layout Views

Power Point gives you four screen layouts for constructing your presentation in addition to the Slide Show. You can select the page view by clicking the buttons at the bottom of the page.



- *Normal View*: This screen is split into three sections showing the presentation outline on the left, the slide in the main window, and notes at the bottom.
- *Outline View:* The presentation outline is displayed on the majority of the screen with small windows for the slide and notes. This view is recommended for editing text.
- *Slide View:* The slide view displays each slide on the screen and is helpful for adding images, formatting text, and adding background styles.
- *Slide Sorter View:* A small image of each slide is displayed in Slide Sorter view. Slides can easily be ordered and sorted from this screen.



Click the *Slide Show* button to view the full-screen slide show.

Working With Slides

Insert a New Slide **:** In the Outline window, select the slide you want the new slide to appear after by clicking the slide's number. Select *Insert|New* Slide from the menu bar or click the new slide button on the standard toolbar. Choose the page layout from the window and press *OK*.

Applying a Design Template: To add a design template or changing the existing one, selection *Format|Design* Template from the menu bar. Select the template and click *Apply*.

Changing Slide Layouts: To change the layout template of the slide select *Format|Slide* Layout from the menu bar. Select one of the layout thumbnail images and click Apply.

Reordering Slides: To reorder a slide in Slide Sorter View, simply click on the slide you wish to move and drag it to the new location. In Normal or Outline View, click the slide icon 5 beside the number of the slide you want to move and drag the icon to a new location.

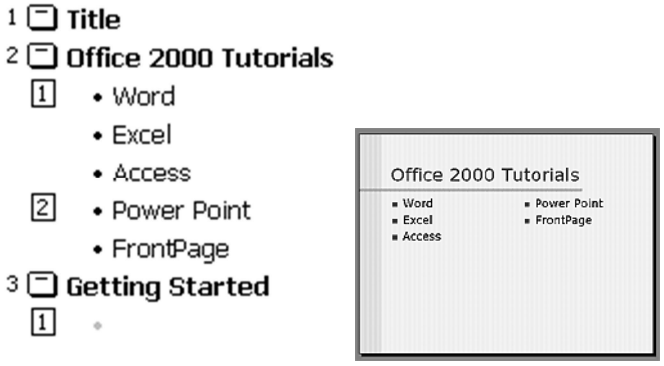
Hide Slides: If you do not want a slide to appear during the slide show, but do not want to delete the slide as it may be used later, the slide can be hidden by selecting Slide *Show|Hide* Slide from the menu bar. To add the slide back to the slide show, select Slide *Show|Hide* Slide again.

Create a Custom Slide Show: The Custom Slide Show feature allows you to select the slides you want to display in the slide show if not all the slides should be used. For this, select *Slide Show|Custom* from the *Slide Show* menu bar; Click the *New...* button in the *Custom Shows* window; In the *Define Custom Show* window, type a name for the slide in the *Slide show name* field; Add slides to the custom show by highlighting them in the *Slides in presentation* window and clicking the *Add >>* button. Those slides will then appear in the *Slides in custom show* window; To remove slides from the custom show, highlight their names in the *Slides in custom show* window and click the *Remove* button; To reorder slides in the custom show, highlight the slide that should be moved and click the up and down arrows to change its order in the show; Click *OK* when finished; Click the *Show* button on the Custom Shows window to preview the custom slide show and click *Close* to exit.

Edit a Custom Slide Show: Select *Slide Show|Custom Slide Show* from the menu bar; Edit the show by highlighting the name in the *Custom shows* box and clicking the *Edit...* button; To delete a show, highlight the name and click *Remove*; Create a copy of a show by clicking the *Copy* button. The copy can then be renamed by clicking the *Edit...* button; Click the *Show* button to preview the custom slide show and click *Close* to exit.

Adding Contents

Bulleted Lists on Design Templates: Bulleted lists allow you to clearly display the main points of your presentation on slides. The text boxes on design templates already include bulleted lists. Click the place holder on the slide to begin adding text and press the *ENTER* key to return to the next line and add a new bulleted item. To go to the next line without adding another bullet, hold down the *SHIFT* key while pressing *ENTER*.



Adding Notes: From *Normal View*, notes can be added to the slide. These notes will not be seen on your presentation, but they can be printed out on paper along with the slide the notes refer to by selecting *Print What: Notes Pages* on the Print menu.

Video: To add a video to your presentation select *Insert*|*Movies and Sounds*|*Movie from File* or to insert an animation from Microsoft's gallery choose *Insert*|*Movies and Sounds*|*Movie from Gallery*. Select the video file and click *OK*.

Audio: To add sound to your presentation select *Insert*|*Movies and Sounds*|*Sound from Gallery* or *Sound from File*. Select a sound file and click *OK*.

Graphics

The Drawing Toolbar provides many commands for creating and editing graphics. The toolbar is located at the bottom of the Power Point screen or it can be activated by selecting *View*|*Toolbars*|*Drawing* from the menu bar.

Adding Clip Art: Select *Insert*|*Picture*|*Clip Art* from the menu bar or click the *Picture* button on the Drawing toolbar. Use various options to insert, preview and edit the clips.

Add An Image from a File: To add a photo or graphic from a file, Select *Insert*|*Picture*|*From* File from the menu bar. Choose the clip and insert it.

Auto Shapes: The AutoShapes toolbar allows you to draw a number of geometrical shapes, arrows, flow chart elements, stars, and other graphics on a slide. Activate the AutoShapes toolbar by selecting *Insert*|*Picture*|*AutoShapes* or *View*|*Toolbars*|*AutoShapes* from the menu bar. Click the buttons on the toolbar to view the options for drawing each shape.

WordArt: Add headlines in striking colors and shapes to your presentation using Word Art. Select Insert|Picture|WordArt from the menu bar or click the Word Art button on the Drawing toolbar. Choose a Word Art style from the listing and click OK.

Slide Effects

Action Buttons: Use the action button toolbar to add functioning buttons to slides in a presentation. Select *Slide Show*|*Action Buttons* from the menu bar. Click the bar across the top of the button menu and drag it off the menu so it becomes a floating toolbar. Click one of the button faces and draw the button on the slide using the mouse. The *Action Settings* menu will then appear. Set the actions under either the *Mouse Click* or *Mouse Over* tabs. Actions specified for

Mouse Click will execute when the button is clicked on the slide while actions for Mouse Over will occur when the mouse pointer hovers over the button. Select an action for the button by choosing a *Hyperlink to* destination. If you want a sound to be played when the button is clicked, check the *Play sound* box and choose a sound from the drop-down menu. Click *OK* when finished. The button on the slide can be resized using the white box handles and the depth of the button can be changed by dragging the yellow diamond.

Slide Animation

Several animations for slide objects are available through the drop-down menus on the menu bar. First, select the text box or graphic that will be animated. Select *Slide Show|Preset Animation* and choose from one of the options. To select a different animation or turn the animation off, select the appropriate choice from the same menu.

Slide Transitions: Select *Slide Show|Slide Transition* from the menu bar. From the *Effect* section, choose a transition from the drop-down menu and notice the preview after the transition is selected. Select a speed for the transition as well. Under *Advance*, check "On mouse click" for the slide transition to occur by clicking the mouse or using keystrokes or check "Automatically after" and a number of seconds if the transition should occur automatically. Select a *Sound* if necessary and check the *Loop until next sound* if it should keep repeating until the next sound is played. Click *Apply to All* if the transition effects should be added to every slide or *Apply* if the effects should be added only to the current slide.

Slide Show Options

Select *Tools|Options* and click the *View* tab to choose from several more slide show options.

- *Popup menu on right mouse click* - Check this box if you want to be able to access the shortcut menu during a presentation.
- *Show popup menu button* - Check this box to activate the menu button that appears in the bottom, left corner of the screen during a presentation.
- *End with black slide* - Insert a blank, black slide to the end of the presentation.

Master Slides

Slide Master: Change the style of all slides in the presentation by changing the properties on the *Slide Master*. Each Design Template has its own Slide Master that can be altered. If you create slides from scratch, a consistent style can be added to the presentation by formatting the Slide Master. Select *View|Master|Slide Master* from the menu bar. Format the master slide just as you would format a regular slide by formatting text, formatting lists, adding background patterns and effects, and setting footers. Click the *Close* button on the *Master toolbar* to quit editing the master slide and return to the presentation.

Headers and Footers: Add the date and time, slide numbers, and other footer text to the master slide from the Header and Footer window. Select *View|Header and Footer...* from the menu bar. Check the *Date and time* box to add this feature to the slide. Select *Update automatically* to always display the current date and time or click *Fixed* and enter a date that will not change in the text field provided. Check the *Slide number* box to add this feature to the slides. Click the *Footer* box and add other text to the footer area of the slide. Check the *Don't show on title slide* box to hide these features on the title slide of the presentation. Click the *Notes and Handouts* tab

to make the same changes to notes and handouts pages. Click *Apply to All* to add the changes to every slide or *Apply* to add only to the current slide.

Slide Numbers: To add the slide numbers in a fixed position on the slide, use the *Header and Footer* window detailed above. The slide number can otherwise be added anywhere on the slide by placing the cursor where the slide number should appear and selecting *Insert|Slide Number* from the menu bar. The text of the slide number can the formatting just as regular text style is changed.

Date and Time: A date and/or time can also be added using the *Header and Footer* window or anywhere else on the slide. Place the cursor where the date and time should appear on the slide and select *Insert|Date and Time* from the menu bar. Select a format from the *Available formats* box and click *Update automatically* if this feature should always be updated to reflect the current date and time. Click *OK* to finish.

Presentation Basics

- Begin the slide show by clicking the Slide Show button on the bottom of the screen.
- Move to the next slide by pressing the *SPACE BAR*, *ENTER*, *PAGE DOWN*, or right arrow keys or by clicking the left mouse button.
- Go back to the previous slide by pressing *BACKSPACE, PAGE UP*, or the left arrow key.
- To end the slideshow before it is complete press *ESC* on the keyboard.
- A pen tool is available for drawing on the screen with the mouse. Press *CTRL+P* or click the right mouse button at any time and a popup window will appear. Choose *Pen* and the pointer will change to a pen that allows you to draw freehand on the screen using the mouse. Press the *E* key to erase all pen strokes. Press *CTRL+A* to disable the pen feature and revert the pen back to a pointer arrow.
- If you would like to use the pen to draw on a blank screen during a presentation, press the *B* or *W* keys, or select *Screen/Black Screen* from the popup menu and the screen will turn black. Press *B* or *W* again or choose *Next* from the popup menu to return to the presentation when you are finished drawing.
- To hide the pointer and button from the screen press the *A* key.
- Be sure to preview the slide show using a projector if one will be used during the presentation. Words or graphics that are close to the edge of the screen may be cut off by the projector.

EXERCISE

- Create a Power Point presentation for the report prepared in laboratory session 4, of not more than 4 slides. Add appropriate animation effects and clip arts where necessary. Attach the printed output here

Lab Session 08

OBJECT

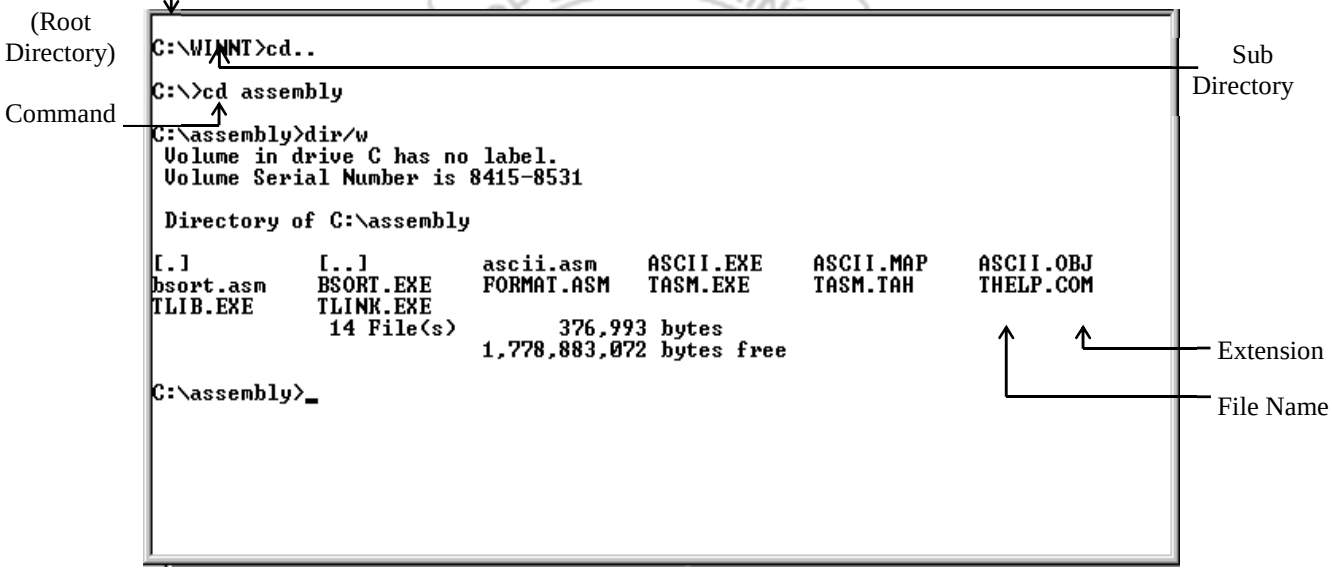
Familiarization with DOS environment and its important commands.

WORKING WITH DOS

Understanding DOS

DOS, the acronym for Disk Operating System, is an operating system with a command-line interface used on personal computers. It provides a set of commands that enables the users to access or manipulate information on their disks, as well as simply interact with their computer.

Dos Commands



DOS commands are of two types namely internal commands and external commands.

- Internal commands are those which are built into command.com.
- External commands are those that must be located from a file loaded by command.com before it can be executed.

A brief description of important DOS commands is given below:

Changing drive

Type drive letter of the drive to which you want to switch to, on the command prompt followed by ':'.

example: c:>a: This will change the current drive from C to A.
result: a:>

Wild Cards

DOS recognizes two wild cards:

- The asterisk (*) represents one or more characters that a group of files has in common.
- The question mark (?) represents a single character that a group of files has in common.

Working with Directories

- **dir** to view the contents of a directory
  syntax: drive:>dir
  example: c:>dir This will list all the files and subdirectories on drive C.

  Use wild cards to display selected lists. For example:
  - drive:>dir *.* displays all files and subdirectories on the drive
  - drive>:dir ?????.com displays all files having names up to five characters and extension 'com'

  dir command can be modified using these wild cards and other switches as follows so that only one screen of selected information is displayed at a time.
  dir /p lists the directory contents page wise.
  dir/w lists the directory contents in a wider format, only file names and extensions.
  dir/w/p lists the directory contents in a wider format, page wise.

- **cd** to change from one directory to another
  syntax: drive:>cd drive:\ path
  example: c:>cd dos This will change the current directory from the root directory to DOS directory on drive C.
  result: c:\maria>

- **md** to create a new directory
  syntax: drive:>md drive:\ path\ dirname
  example: c:>md neduet This will create a new directory named 'neduet' on drive C.

- **cd..** to switch back one level up in the directory structure
  syntax: drive:\ dir:>cd..
  example: c:\dos>cd.. This will switch back to root directory of drive C.
  result: c:\>

- **rd** to delete a directory
  syntax: drive:\ dir:>rd drive:\ path\ dirname
  example: c:\>rd neduet. This will switch back to root directory of drive C.

Working with Files

- **copy** to copy a file from one directory or drive to another
  syntax: drive:> copy drive:\source path\filename
  drive:\destination path\ filename
  example: c:\>copy c:\neduet\cfile.exe c:\windows
  This will copy cfile.exe from *neduet* directory to windows directory.

- **ren** to rename a file
  syntax: drive:>ren drive:\path\old filename drive:\path\new filename
  example: c:\>ren cfile.exe edit.exe
  This will rename *cfile.exe* to *edit.exe*.

- **del** to delete a file
  syntax: drive:>del drive:\path\filename
  example: c:\>del cfile.exe This will delete *cfile.exe*.
  Wild cards can be used with any of the above commands to work with group of files.

- **type** to view a file on the screen.
  syntax: drive:>type drive:\path\filename
  example: c:\>type file.txt This will list *cfile.exe*.

  Files longer than one screen scroll off the top. To avoid this, use ctrl+s keystroke or more, following the command**.**

  example: c:\>type file.txt |more

- **fc** to compare files in either ASCII or binary mode
  syntax: drive:>fc drive:\path\filename1 drive:\path\new filename2
  example: c:\>fc a:\command.com c:\DOS\drivers\command.com
  This will compare the two files.

Disk Management

- **format** to format a disk
  syntax: drive:>format drive:
  example: c:\>format a: This will format floppy disk in *drive A*.

- **diskcopy** to copy all contents of one disk to another. It is a floppy only command
  syntax: drive:>diskcopy drive1: drive2:
  example: c:\>diskcopy a: b:
  This will copy everything from disk in *drive A* to disk in drive B.

- **chkdsk** to get a report on statistics of the disk
  syntax: drive:>chkdsk drive:
  example: c:\>chkdsk c: This will generate a report on statistics of *drive C.*

- **diskcomp** to verify that two disks are identical by comparing each track of one disk to another, sector by sector. It's a floppy only command

  syntax: drive:>diskcomp drive1: drive:
  example: c:\>diskcomp a: b:
  This will compare the contents of disk in *drive A* with that of disk in *drive B.*
  syntax: drive:>ver
  example: c:\>ver This will display the current version of DOS on your system.

- **path** to set command search path
  syntax: drive:>path drive:\pathname1
  Use ';' to specify more than one paths)
  example: c:\>path c:\neduet;c:\float
  This will tell Dos to search for programs in *neduet* directory, then in float directory.

- **doskey** to recall previously generated DOS commands
  syntax: drive:>doskey
  example: c:\>doskey This will install doskey.

  Use UP and DOWN ARROWS to recall commands; ESC clears command line; F7

displays command history; ALT+F7 clears command history; F8 searches command history; F9 selects a command by number.

MAKING BATCH FILES

A batch program of a batch file is a text file that contains a series of commands that DOS carries out when its name is typed at the command prompt.

AUTOEXEC.BAT file is an example of such files. It is a special batch program that runs every time you start your computer. It starts necessary programs and does settings at the startup.
To make a batch file

- Open a new text file in an editor (DOS editor, 'EDIT' can be used, type edit at the command prompt to see this editor).
- Type DOS commands, which are to be included in the batch program in this text file. Each command is typed on a different line.
- Save the file with suitable name provided that its extension is *bat*. For example, *mybatch.bat*

The Echo Command

This command directs DOS whether or not to display the commands in a batch file.
syntax: echo on/off

An alternate is to insert **@** sign before the command.
example: @ dir
This if included in the batch file, will prevent dir command from displaying on the command prompt.

The Call Command

This command calls one batch program form another.
syntax: call [drive:][path]filename
example: make a batch file named one.bat with command dir/p
make another batch file named two.bat with the following two commands:
help
call one.bat
From DOS prompt rum two.bat
drive:>two.bat
result: This will display the directory listing, page wise and then the help file

The Pause Command

This command suspends processing of a batch program and displays the message:
Press any key to continue...
syntax: pause
example: make a batch file named one.bat with command dir/p

make another batch file named two.bat with the following two commands:

help
pause
call one.bat
From DOS prompt rum two.bat
drive:>two.bat

result: This will display the directory listing page wise, then pause and wait for a key from the user and on receiving a key will display the help file.

The Rem Command

This command records comments <remarks> in a batch file
syntax: rem [comments]
example: make a batch file named remark.bat with the following commands:

dir/p
rem moving to root directory
cd\
From DOS prompt rum two.bat
drive:>remark.bat

result: This will display the directory listing page wise, will then print the remark "moving to root directory" and will then move to the root directory.

Using Replaceable Parameters

Replaceable parameters (%0 through %9) are placeholders for parameters typed at the command prompt. This helps to use a single batch program for many parameters.
example: Suppose the BAKIT.BAT program includes the copy command with two replaceable parameters:

copy %1 %2

At the command prompt, you can type the two corresponding parameters, as in the following command:

bakit c:\com*.* a:

result: replaces %1 with c:\com*.* and %2 with a:.

Using the If Command

If you want a batch file to be carried out only after certain conditions have been met, use the if command.
example: Suppose STAR.BAT file includes the following command:

if "%1" = = "W" c:\word\word

At the command prompt, type the following:

star W

result: this starts Microsoft word when the parameter used is W.

The parameter and the text it is compared with must be enclosed in quotations marks, and they must match exactly. The comparison is case sensitive.

The Goto Command

To switch to another part of a batch program, use the goto command and a label. The label (preceded by a colon) must appear on its own line elsewhere in the batch program.
example: goto skipdown
    echo this comment command will be skipped
    :skipdown
    doskey
result: the echo command will be skipped.

EXERCISE

1. Write command to display all files having extension 'com'

Ans: _____

2. Write command to display all files having names up to five characters with middle letter 'a', e.g. sm**a**rt.com

Ans: _____

3. Write command to copy all files having extension 'com' from 'neduet' directory on C drive to 'fruit' directory on the same drive.

Ans: _____

4. Write command to delete all files having extension 'old' and starting with letter 'p'.

Ans: _____

5. Write command to display all file names on the disk in drive A and having an extension of no more than two characters.

Ans:_____

6. Write command to change C prompt to 'hello:'. Write another command using '$' to switch back to the standard C prompt (C:\>).

Ans:_____

7. Write command to set system date to January 1, 2002.

Ans:_____

8. Make a batch file which includes the commands to make a directory called 'examples' on C drive, then display the directory and file listing of the same drive and then move into the newly made directory 'examples'. Print remarks/comments on what each command does before its respective execution and do not echo any of actual commands on the screen. Give the listing of the file below**.**

Ans: _____ _____

Section Three:

Computer Hardware

Components Required

Bread board, 5 V - power supply, multimeter, logic probe (or LEDs with resistors), wires, following ICs and their datasheets:

- 7408 quad 2 input AND gate
- 7432 quad 2 input OR gate
- 7404 hex inverter
- 7400 quad 2 input NAND gate
- 7402 quad 2 input NOR gate

Lab Session 09

OBJECT

Experimenting with the AND, OR, NAND, NOR and NOT integrated circuits.

THEORY

Logic Gates

Logic gates are the fundamental building blocks of digital systems. These devices are able to make decisions, in the sense that they produce one output level when some combinations of input levels are present and a different output when other combinations are applied; hence given the name Logic Gates.

The two levels produced by digital circuitry are referred to variously as HIGH and LOW, TRUE and FALSE, ON and OFF, or simply 1 and 0.

There are only three basic gates: AND, OR and NOT. The other gates are merely combinations of these basic gates.

1. The AND Gate – An AND gate's output is 1 if and only if all its inputs are 1. If A and B are two inputs to an AND gate then output, F of the gate is given as: $F = A.B$

2. The OR Gate - An OR gate's output is 1 if at least one of its input is 1. If A and B are two inputs to an OR gate then output, F of the gate is given as: $F = A+B$

3. The NOT Gate (Inverter) – Its output is 1 when its input is 0 and its output is 0 when the input is 1; i.e. it complements a digital variable. If A is the input to a NOT gate then output, F of the gate is given as: $F = \overline{A}$

4. The NAND Gate – Its output is 1 if at least one of its $\overline{\text{input}}$ is 0. This gate performs the same logic as an AND gate followed by an inverter. If A and B are two inputs to a NAND gate then output, F of the gate is given as: $F = A.B$

5. The NOR Gate - The output of a NOR gate is 1 if and only if all its inputs are 0. This gate performs the same logic function as an OR gate followed by an inverter. If $\underline{\text{A}}$ and B are two inputs to a NAND gate then output, F of the gate is given as: $F = A+B$

All the above gates have one output and two or more inputs except the NOT gate, which has only one input.

PROCEDURE

1. Set the power supply to 5V. With the help of a multimeter check the voltage at the output knobs of the power supply.
2. Connect wires, long enough to reach the bread board, with the two knobs of the power supply. Again using multimeter, check the voltage at the non-connected end of the wires.
3. Insert the 7408 quad 2 input AND gate IC on to the bread board and make supply and ground connections by joining 5V wire to pin # 14 and 0V wire to pin # 7.
4. Consult IC's internal connection diagram for input and output pins of the first AND gate. Connect input pins to logic 0 (0V) and observe the output using LED or logic probe.
5. Try different combinations of logic levels at the two inputs. Again observe the output.
6. Repeat the last two steps for all other gates of the same IC. Record the observations.
7. Repeat this procedure for all other ICs.

Exercise

1. Read the details of each of the IC discussed from the respective datasheets and verify the expected outputs.

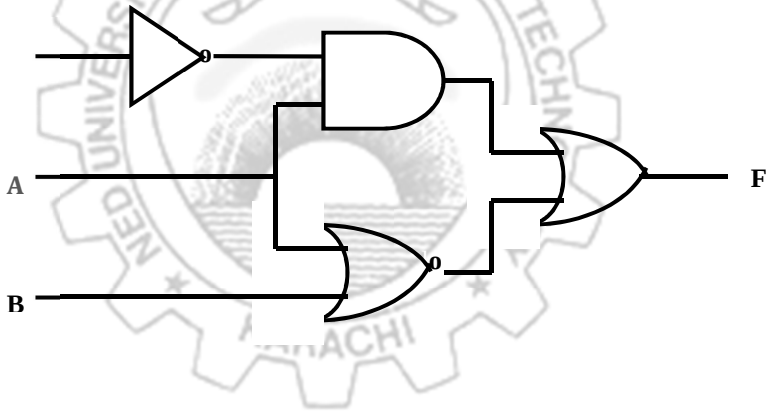
Lab Session 10

OBJECT

Finding expression for the given logic diagram, implementing the circuit on bread board, and observing output for various combinations of inputs.

- 7408 quad 2 input AND gate
- 7432 quad 2 input OR gate
- 7404 hex inverter
- 7402 quad 2 input NOR gate

LOGIC DIAGRAM



Logic gates can be interconnected to perform a variety of logical operations. This interconnection of gates to achieve prescribed outcomes is called logic design.

PROCEDURE

8. Set the power supply to 5V. With the help of a multimeter check the voltage at the output knobs of the power supply.
9. Connect wires, long enough to reach the bread board, with the two knobs of the power supply. Again using millimeter , check the voltage at the non-connected end of the wires.
10. Insert ICs on the bread board and make their supply and ground connections.
11. As given in the logic diagram, make connections using wires and gates in the ICs.
12. Apply different combinations at the three inputs and observe the output.

OBSERVATIONS

Logic expression for the given logic diagram: _____

A	B	C	Expected Output	Observed Output
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

Exercise:

For the following exercises, develop a Boolean expression that satisfy the given scenario . Give meaningful variable names to inputs/outputs.

1. An automatic vehicle system which ensures that the the belt buzzer starts its beep as soon as the key is inserted.
2.A UPS who displays an alert signal as soon as the battery gets charged fully.
3. Real world example to be assigned by the instructor.

Lab Session 11

OBJECT

Working with Electronics Workbench – A CAD Tool.

ELECTRONICS WORKBENCH - EWB

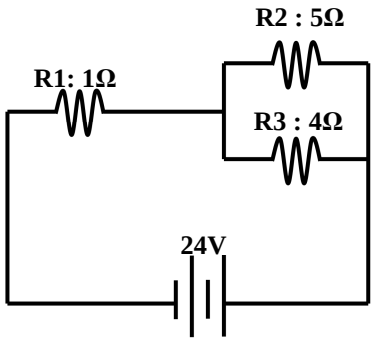
Electronics Workbench is a computer aided design tool that provides you with all the components and instruments necessary to create board-level designs. It has complete mixed analog and digital simulation and graphical waveform analysis, allowing you to design your circuit and then analyze it using different simulated instruments and analysis options. It is fully integrated and interactive, thus you can change your circuits quickly, allowing fast and repeated what-if analysis.

Electronics Workbench provides the following kind of components:

- Sources parts bin *(AC voltage source, Vcc source, ground, battery, etc)*
- Basic parts bin *(resistors, capacitors, transformers, switches, etc)*
- Diodes parts bin
- Transistors parts bin
- Analog ICs parts bin *(op-amps, etc)*
- Mixed ICs parts bin *(ADCs, DACs, 555 timers, etc)*
- Digital ICs parts bin *(AND, OR, adders, multiplexers, etc)*
- Indicators parts bin *(voltmeter, ammeter, probe, displays, etc)*
- Controls parts bin *(voltage differentiator, multiplier, etc)*
- Instruments parts bin *(multimeter, oscilloscope, function generator, etc)*
- Miscellaneous parts bin *(write data, textbox, etc)*
    - *Write data:* This component allows you to save simulation results as an ASCII file.
    - *Text Box:* Use this to add descriptive text anywhere in a circuit.

ACTIVITY

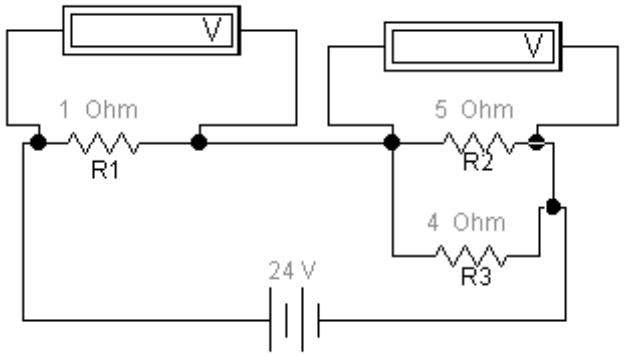
Design the following circuit in Electronics Workbench and measure the voltage across each resistor.



Procedure

1. From *Basic parts bin*, Drag and drop a *resistor* on the design area.
2. Right click this component and select *Component Properties*. Click the *Value* tab, set the resistance to 1 ohm.
3. Repeat these two steps to place R2 and R3 *resistors* and a 24V *battery*.
4. Connect the terminals of these components as required. Use additional connectors form the *basic parts bin* if you want to connect two wires at a single node.
5. Now add two *voltmeters* from *indicators parts bin* to the circuit. Connect one voltmeter across R1 and the other across R2 or R3.
6. Label the circuit properly using *text boxes* found in the *miscellaneous parts bin*.
7. Run the circuit using the *Activate Simulation* switch. Record the voltages across different terminals that appear in the *voltmeters*.

EWB Circuit



Observations

Resistor	*Observed Reading*	*Calculated Reading*
R1		
R2		
R3		

PRACTICE PROBLEM

For the circuit given in this session, measure the current through each resistor for the following values:

Resistor Ω	*Observed Reading*	*Calculated Reading*	*Resistor* Ω	*Observed Reading*	*Calculated Reading*	*Resistor* Ω	*Observed Reading*	*Calculated Reading*
R1=1			R1=2			R1=2		
R2=5			R2=2			R2=4		
R3=4			R3=2			R3=4		

Section Three:

Visual Basic Programming

Components Required:

USB to TTL Converter.

Lab Session 12

OBJECT

Designing a Simple Stop Watch using VB Timer Control

THEORY

In this lab session you will be introduce with different tools (command buttons, label, text boxes etc) available in the tool box in Visual Studio 2010 in VB.NET and learn how to change their properties.The Timer control allows you to perform a task at a specified interval or to wait for a specified length of time.

STEPS

To create a Stopwatch, you will create a new project as previously explained. Once the project is created and you have selected a form for the form design, you will want to create three labels, which will all have default names (Label1, Label2, and Label3). You will also need to drag the btnStart and the btnExit to the form. For each of the Labels change the text to the number 0, for the btnStart you will want to changes the text to Start/Stop, and for the btnExit, change the text to Exit. Lastly, you will create a timer, which will be called tmrTime in the toolbox. In order for this timer to count at the correct intervals, you muct change the timer interval to 1000, which signifies 1 second. After you have finished with the design of the application, you will need to put some code in to make it function.

CODE

Following code will be written in the click event of btnStart.

```
Private Sub btnStart_Click()
If tmrTime.Enabled = False Then
tmrTime.Enabled = True
Else
tmrTime.Enabled = False
End If
End Sub
```

The next step is to code the timer itself, which will allow the timer to continue counting upward until the Start/Stop button is pushed. To do this you will click on tmrTime and enter into the code editor:

```
Private Sub tmrTime_timer()
Label3.Caption = Val (Label3.Caption) + Val(1)
```

```
If Label3.Caption = 60 Then
Label2.Caption = Val (Label2.Caption) + Val(1)
Label3.Caption = 0
ElseIf Label2.Caption = 60 Then
Label1.Caption = Val(Label1.Caption) + Val(1)
Label2.Caption = 0
End If
End Sub
```

The next code will make it so that when the form is loaded, the timer won't start until the Start/Stop button is clicked. The following code must be typed into the Code Editor to make this happen:

```
Private Sub Form_Load()
tmrTime.Enabled = False
End Sub
```

Next to exit the application when you are finished using it write the following code:

```
Private Sub btnExit_Click()
Unload Me
End Sub
```

EXERCISES

1. Create an advance (scientific) calculator that performs all scientific operations in VB.NET.

Lab Session 13

OBJECT

Interfacing between two PC'S using USB to TTL and SN75176 IC with HyperTerminal .

WHAT IS SERIAL COMMUNICATION?

Serial communication is forms of I/O in which the bits of a byte begin transferred appear one after the other in a timed sequence on a single wire. It has become the standard for inter-computer communication.

TYPES OF SERIAL COMMUNICATION:

There are two types of serial communication:

- Synchronous communication
- Asynchronous communication

Synchronous Communication:

In synchronous communication the data is transmitted and received through a common clock.

Asynchronous Communication:

In Asynchronous communication we have to add start bit, stop bit and for checking we can also add parity bit. In our project we will be using Asynchronous communication. In Asynchronous communication the transmitter shifts the parallel data onto the serial line using its own clock while the receiver extracts the data using its own clock. It converts the serial data back to the parallel form after stripping off the start, stop, and parity bits.

EXAMPLE:

When transmitting a byte say letter 'A', the UART (serial port) first sends a START BIT which is a positive voltage (0), followed by the data which in this case will be the ASCII of the letter i.e. 01000001 (general 8 bits, but could be 5, 6, 7, or 8 bits) followed by one or two STOP BITs which is a negative (1) voltage. The sequence is repeated for each byte sent.

USB TO TTL:

This USB to TTL converter is a port-powered bi-directional USB to TTL/CMOS 5V converter, which can be used to convert any standard full-duplex USB port into a full-duplex TTL port and vice versa. The unit is powered from the USB port and it supports data auto-sensing & self-adjusting, and therefore, no baud rate setting is required.

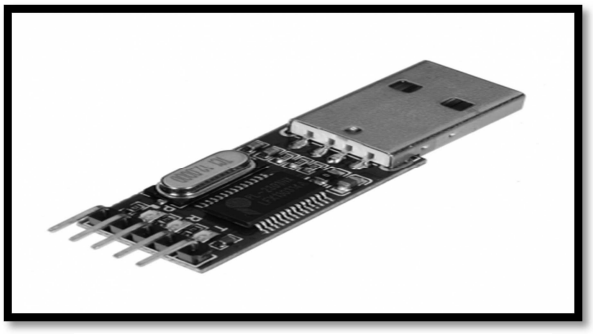


Fig 13.1: USB to TTL converter

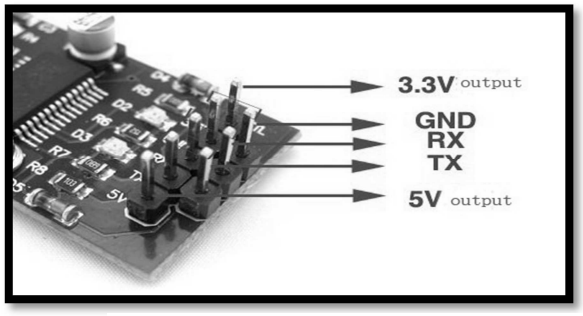


Fig 13.2: Pin Configuration

The USB TTL Serial cables are a range of USB to serial converter cables which provide connectivity between USB and serial UART interfaces. Sometimes you need to access serial port of your PC/LAPTOP to perform some actions like if you want to connect a GSM modem or if you are an Embedded systems programmer then to access program or interface your micro-controllers to your system. If you are performing these tasks on either Windows or Linux then you will requires some program that can communicate with your hardware and system. In the old days, Windows used to be provided Hyper terminal (from Windows Vista we need to install hyper terminal).

HyperTerminal Overview:

HyperTerminal is a program that you can use to connect to other computers, Telnet sites, and bulletin board systems (BBSs), online services, and host computers, using either your modem, a null modem cable or Ethernet connection. HyperTerminal records the messages passed to and from the computer or service on the other end of your connection.

Steps

1. If your system does not have any serial port , you can still use a USB-to-Serial adapter after installing its driver. This driver makes a virtual serial port in your system.In Windows, serial port named as COM port.
2. Open HyperTerminal application, dialogue box will appear namely Connection description.

Create a new Connection by specifying name, communication port and COM port properties. Set Location information as per your requirement if configuring for the first time.

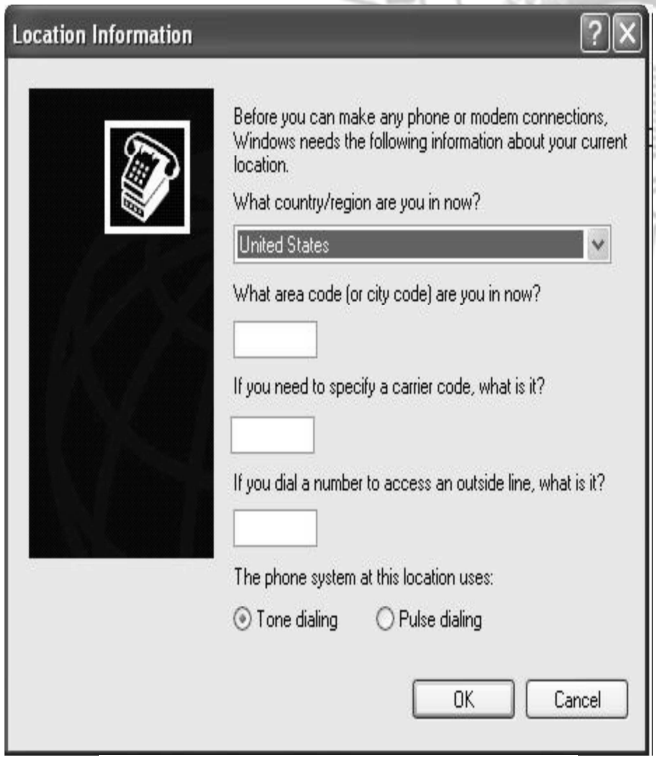

Location Information
Before you can make any phone or modem connections, Windows needs the following information about your current location.
What country/region are you in now?
United States
What area code (or city code) are you in now?
If you need to specify a carrier code, what is it?
If you dial a number to access an outside line, what is it?
The phone system at this location uses:
Tone dialing
Pulse dialing
OK
Cancel

Fig 13.3: Location Information

Fig 13.4: New Connection

3. Enter any name for your connection and use icon from the given icons.

Fig 13.5: New Connection – Hyper Terminal

4. Dialog box will appear, select the COM Port number. Click ok.

Fig 13.6: USB to TTL – Hyper Terminal

5. Dialogue box of your COM port properties will open. Click restores default to have default settings of COM port. Click ok.

6. Application will be opened to communicate between two PCs.

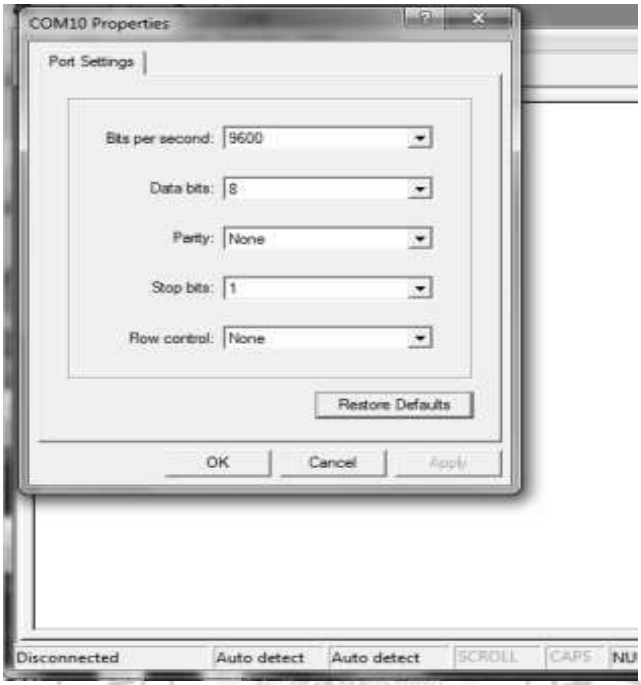


Fig 13.7: COM10 Properties

7. A string Hi was received from another PC as can be seen below.

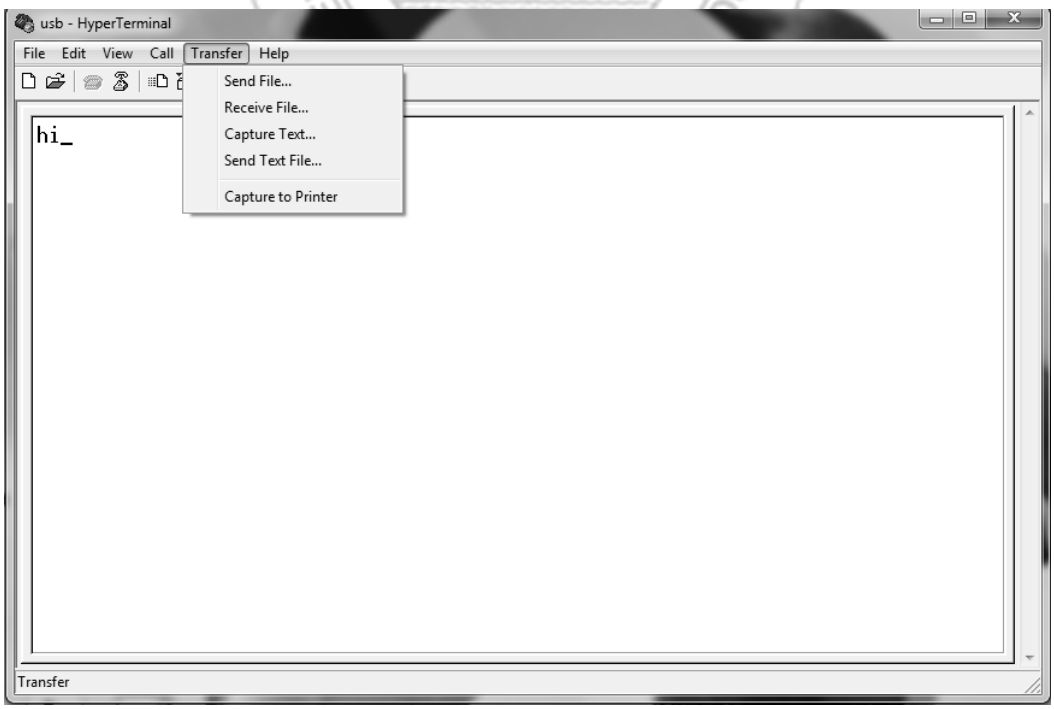


Fig 13.8: USB – Hyper Terminal

Lab Session 14

OBJECT

Serial Port Interfacing with VB.net 2010

THEORY

The serial (COM) port is one of the simplest ways to communicate between a PC and a microcontroller circuit. Most microcontrollers have hardware serial ports and most microcontroller compilers have built-in functions to read from and write to the hardware port. Hardware serial ports with their 9-pin D connectors have disappeared from laptop and desktop computers, but are easily produced with a low-cost USB-to-serial cable adaptor. For embedded systems, a common approach is to add a FT232R USB-to-serial chip to the circuit so that the hardware connects to the PC though USB. Another option is to add a USB-to-serial module, for example the UM232R by FTDI or the USBMOD3 from DLP Design. These modules add glue circuits and a USB connector to the converter chip for an easy-to-use self contained solution. On the PC side, the USB adaptor appears as a virtual serial port that can be accessed by an application program just like a hardware COM port.

On the microcontroller side, the adaptor appears as a standard serial port. If using an adaptor cable, the application circuit needs a convertor chip, for example the Dallas DS275 or the Maxim MAX233 to convert RS-232 serial levels to TTL logic levels.

Checking the Virtual Serial Port Connection

Check that device appears as a COM port on the PC by using the Device Manager. Right-click on My Computer > Properties > Hardware > Device Manager > Ports (COM & LPT). Should see something like PL2303 COM Port (COM6), which means the cable is showing up as COM port number 6. Your port number may be different. The port number will change if you plug the cable into a different USB port on your computer.

VB.net Code

The serial port functions are in the .NET System.IO.Ports library.

ACTIVITY

Design and write code in VB.NET that demonstrates the use of the SerialPort class to allow two users to chat from two separate computers.

Section Four:

Working with HTML

Lab Session 15

OBJECT

Creating HTML page using different tags.

THEORY

HTML – Hypertext Markup Language

Hypertext is the text stored in electronic form with cross-reference links between pages. Hypertext documents are written in languages called Markup Languages. HTML (Hypertext markup language) is one of such languages. It features hypertext links which can transport you to a site or anywhere else in the world. The new document is located by its URL and can be another HTML document, pictures, sound files, etc. HTML is designed to be platform independent, not bound to a particular hardware or software environment.

HTML Editors

HTML programs are written as plain, ASCII text files. Any text editor can work as HTML editor. Notepad is one of most widely used HTML editors around. However, working with Notepad one needs to be very well versed with HTML tags. For a little more power and flexibility commercial HTML editors like Adobe Pagemill and Microsoft FrontPage are also available which provide a 'What - You - See - Is - What - You - Get' authoring environment.

Essentials for every HTML Page

Tags

An HTML tag is a coded command used to indicate how part of a Web page should be displayed. In every HTML page, the words starting with < and ending with > are actually called HTML tags because they tag pieces of text and tell the Web browser what kind of text it is. This allows the Web browser to display the text appropriately.

Most HTML tags have two parts: an opening tag, to indicate where a piece of text begins, and a closing tag, to show where the piece of text ends. Closing tags start with a / (forward slash) just after the < symbol. Many tags also include attributes, in the form *attribute name = attribute value* which add options to that particular tag. Tags may be in either upper case or lower case.

Every Web page created must include the following tags:

- `<html>` tag - Putting `<html>` at the very beginning of a document simply indicates that this is a Web page. The `</html>` at the end indicates that the Web page is over.

- `<head>` tag - Encloses the header of the document. Information that goes includes title together with other information to make the page more search-engine friendly. `</head>` is the ending tag.
- `<title>` tag - The header must include the this title tag, which contains the page title. This title appears in the title bar of the browser and is used when saving bookmarks. Only one title can appear in a document and the title cannot contain links or highlighting. `</title>` is the ending tag.
- `<body>` tag - The `<body>` tag tells the Web browser where the actual body text of the page begins, and `</body>` indicates where it ends. It contains all the text, images, hyperlinks and other material to be displayed in the main display area of the Web browser window . It has numerous attributes that control the default colors and background properties for the page.

Other Important tags

Paragraph Tags

When a Web browser displays HTML pages, it pays no attention to line endings or the number of spaces between words. To set apart a block of text as a paragraph, it should be placed in between a pair of paragraph tags, `<p>` and `</p>`. Any text places between these two tags will be set apart as a paragraph, with a blank line above it and a blank line below it.

To set alignment of the paragraph, use the attribute 'align'. Values that can be used with this attribute are center, left and right. For example,

```
<p align=center>
The text here becomes a paragraph
</p>
```

This will centrally align the given text, leaving lines above and below it.

Break

Sometimes the user wants to force a line break in text without beginning a new paragraph. For this break tag, `<br>` is used. The text which immediately follows will jump to the next line. This tag does not have an ending tag.

Font Color

The use of font color tag is similar to the font size tag, except that the attribute used here is 'color'. For example,

```
<font color=red>Text to be effected here</font>
```

Color name can also be replaced by six digit hexadecimal color code, which are used to express amount of red, blue and green in any given color. Codes for some of the common colors are:

#000000 – black ; #FFFFFF – white ; #FF0000 – red ; #00FF00 – green ; #0000FF – blue ; #A020F0 – purple ; #A52A2A – brown. The hash mark in front of the codes is entirely optional.

More Text Styling & Formatting Tags

The following tags can be used to add various styles to text.

- `<font size=value>` Defines the size of the font from 1 to 7 with 1 being the smallest.
- `<font face=value>` Will display the text in the font face like (Times New Roman, etc) specified as value, if that font is on the computer of the person looking at the page.
- `<I> .. </I>` or `<em> ... </em>` Emphasis the text, usually puts it in italics.
- `<b>..</b>` or `<strong>..</strong>` Stronger emphasis, usually puts it in bold.
- `<blink>..</blink>` Causes text to blink irritatingly.
- `<small>` Small text
- `<big>` Big text
- `<super>` Superscript
- `<sub>` Subscript
- `<strike>` Strikethrough (draws a line through text)
- `<u>` Underline

Background Color, Text Color & Base Font

This command, `bgcolor` is used to change the background color and is added as RGB code to the existing body tag.
By default background color of all WebPages is white. To change the color of whole text in the body, text command is used as attribute in the body tag. For example,

```
<body bgcolor=blue text=white>
```
This will write white text on a blue background.

Similarly, to set a single font for all the text in the body, use `<basefont SIZE=5>` just after the `<BODY>` tag. `<basefont>` is just a time-saving tag for setting the overall size of all text in a document. The size of all headings will also be relative to the `<BASEFONT SIZE>`. This tag can't take any attributes other than `SIZE`, and doesn't require a closing `</BASEFONT>` tag.

The <hr> tag

The `<hr>` tag causes a horizontal rule line. Inserting a horizontal rule with the `<hr>` tag also causes a line break, even if a `<br>` tag in not included along with it. For a little extra blank space above or below a horizontal rule, a `<p>` tag before or after the `<HR>` tag can be used. No ending

tag is required. Various attributes like width, size, align, color, etc can be used with to customize the line. For example,

```
<hr width=50% align=left size 10 nonshade color=green>
```

Headings

For creating headings on WebPages a separate command heading, `<h>` is used. Headings can also be made by using font command and its size attributes, but heading command can do it in a simpler way. For example, consider the following text without using heading tag:

```
<p align=center><b><font size=6>welcome</font></b><p/>
```

With heading command it will reduce to the following piece of code:

```
<h1 align=center>welcome</h1>
```

The heading tags come in six unique sizes, ranging from `<h1>` to `<h6>`, with 6 being the smallest. Beside align attribute, other attributes like color, etc can also be used with the heading tag.

Predefined & Type Writer Text

By using type writer command, `<tt>` and `</tt>`, all the text appears on the Webpage as type writer (mono spaced) text. Since HTML shows the text continuous, lots of time and instructions are required to put text containing spaces and tabs. But anything written in between the predefining tags, `<pre>` and `</pre>`, makes the browser process the spaces as well as tabs and enter keys. This command shows the text in only type writer format. For example,

```
<pre>
     To,
     The Chairman,
     CISE,
     NEDUET,
     Karachi.
          SUBJECT: Application for job
<pre/>
```

Special Characters

Most fonts now include special characters for European languages, such as the accented e in Café. There are also a few mathematical symbols and special punctuation marks such as the circular bullet. To insert such special characters at any point in an HTML document by inserting the appropriate code for that character. For example, the word Café would look like Café in the text. Each symbol also has a mnemonic name that might be easier to remember than the number. Another way to write Café, for instance, is Café .

Character	*Numeric Code*	*Code Name*	*Description*
"	"	"	Quotation mark
&	&	&	Ampersand
<	<	<	Less than
>	>	>	Greater than
Cents	¢	¢	Cent sign
[sterling]	£	£	Pound sterling
¦	¦	¦ or brkbar;	Broken vertical bar
SS	§	§	Section sign
©	©	©	Copyright
®	®	®	Registered trademark
deg.	°	°	Degree sign
+/-	±	±	Plus or minus
^{2}	²	²	Superscript two
^{3}	³	³	Superscript three
.	·	·	Middle dot
^{1}	¹	¹	Superscript one
[dieresis]	¼	¼	Fraction one-fourth
'	½	½	Fraction one-half
P	¾	¾	Fraction three-fourths
Æ	Æ	Æ	Capital AE ligature
Æ	æ	æ	Small ae ligature
É	É	É	Accented capital E
É	é	é	Accented small e
X	×		Multiply sign
/	÷		Division sign

Table 15.1: *Special Characters*

EXERCISES

1. Write a complete HTML Web page with the title "Foo Bar Home Page" and a heading at the top which reads "Happy Hour at the Foo Bar," followed by the words, "Come on down!" in regular type.

2. Write the HTML to produce the following:
   Come for ~~cheap~~ free H_2O on May 7^{th} at 9:00PM

3. What's the difference between the following two lines of HTML?
   Deep <TT>S p a a c e</TT> Quest
   Deep <PRE>S p a a c e</PRE> Quest

4. How would you say, "We're having our annual Nixon Impeachment Day SALE today!" in normal-sized blue text, but with the word "SALE" at the largest possible size in bright red?

5. How do you say "© 1996, Webwonks Inc." on a Web page?

Lab Session 16

OBJECT

Create HTML page with lists and links.

THEORY

Arranging Text in Lists

There are three basic types of HTML lists.

- *Ordered lists* - they are indented lists that have numbers or letters in front of each item. It begins with the `<OL>` tag and ends with a closing `</OL>` tag. Numbers and line breaks appear automatically at each `<LI>` tag, and the entire list is indented. In `<OL>` tag, attribute 'type=*value*' can be used to specify the number formats. The *value* indicates: 1 – Arabic numbers ; a – lowercase alphanumeric ; A – uppercase alphanumeric ; I – lowercase roman numbers ; I – uppercase roman numbers. Another attribute that can be used is 'start=*value*', where *value* indicates the beginning of the list's number sequence. In addition, `<LI>` tag can use an attribute 'value=*value*', to force to make a particular list item to have a certain number.

- *Unordered lists* – they are indented lists with a special bullet symbol in front of each item. It opens with the `<UL>` tag and closes with `</UL>`. It looks just like an ordered list, except that bullets appear at each `<LI>` tag instead of numbers.

- *Definition lists* - they are indented lists without any number or symbol in front of each item. It starts with the `<DL>` tag and ends with `</DL>`. The `<DT>` tag goes in front of each term to be defined, with a `<DD>` tag in front of each definition. Line breaks and indentation appear automatically.

- *Menu and directory lists* – these types of lists are rarely used and most browsers treat them identically to unordered lists. Directory lists use `<dir>` and `</dir>` tags, and menu lists use `<menu>` and `</menu>` tags.

For example,

```
<ol type=i start=4>
      <li>Milk
      <li>Bread
      <li>Egg
      <li value=14>Dark Chocolate
      <li>Avocados
  </ol>
```

Following is the output in the body portion of the browser:

iv. Milk

v. Bread
vi. Egg
xiv. Dark Chocolate
xv. Avocados

Lists within Lists

Although definition lists are officially supposed to be used for defining terms, many Web page authors use them anywhere they'd like to see some indentation. In practice, the user can indent any text simply by putting `<DL><DD>` at the beginning of it and `</DL>` at the end. The user can indent items further by nesting one list inside another, like this:

```
<DL><DD>This item will be indented
<DL><DD>This will be indented further
<DL><DL><DD>And this will be indented very far indeed
</DL></DL></DL></DL>
```

Just make sure to always have the same number of closing `</DL>` tags as opening `<DL>` tags. Ordered and unordered lists can also be nested inside one another, down to as many levels as required.

Linking to Other Web Pages

Absolute Addresses

The tag to create a link is called `<A>`, which stands for anchor. The address of the page to link to is put between these tags in quotes after `'href='`, like

```
<a href="http://netletter.com/dicko/welcome.htm">Click here!</a>
```

The link above would display the words `Click here!` in blue with an underline. When someone clicks on it, they would see the Web page named `welcome.htm`, which is located in the dicko folder on the Web server computer whose address is netletter.com. *href* stands for Hypertext Reference and is called an attribute of the `<a>` tag.

Linking Between User's Own Pages

When the user creates a link from one page to another page on the same computer, it isn't necessary to specify a complete Internet address. If the two pages are in the same directory folder, the user can simply use the name of the HTML file, like this:

```
<a href="pagetwo.htm">Click here to go to page 2.</a>
```

Relative Addresses

If the user has many pages, he'll want to put them in more than one directory folder. In that case, he still shouldn't use the full Internet address to link between them. He can use relative addresses, which include only enough information to find one page from another. A relative address describes the path from one Web page to another, instead of an absolute Internet address.

For instance, suppose the user is creating a page named zoo.htm in a directory folder named web pages on the hard drive. He wants to include a link to a page named african.htm, which is in a sub-folder named elephants within web pages. The link would look like this:

```
<a href="elephants/african.htm">Learn about African
elephants.</a>
```

Intra-Page and E-mail Links

Using Named Anchors

The <a> tag can also be used to create link to a portion on the same web page. To make such links the <a> tag is used twice; once to name a portion and then to jump to that portion through a link. To give a name to the specific point on the page:

```
<a name="top"></a>
```

Now to jump to the above named tag:

```
<a href="#top">Return to top of document.</a>
```

The # symbol means that the word "top" refers to a named anchor point within the current document, rather than a separate page. So when a reader clicks on Return to top of document., the Web browser will display the part of the page starting with the <A NAME="top"> tag.

Linking to a Specific Part of Another Page

The user can even link to a named anchor on another page by including the address or name of that page followed by # and the anchor name. for example,

```
<a href="mailto:articles.htm#two">II. The President</a>
```

Clicking on "II. The President" will bring up the page named articles.htm, and go directly to the point where `<a name="two">` occurs on that page.

Linking E-mail Addresses to a Web Page

The `<A>` tag also allows a user to link to his e-mail address. This can be made almost completely effortless for the senders of mails to send a message at a specified email address by providing a clickable link to that e-mail address instead. For example,

```
<a href="mailto:abc@hotmail.com">Send me an e-mail message.</a>
```

Link Colors

There are three separate attributes for link colors that cab be included in the body tag:

1. “link=*value(color)*" colors links that haven't been visited recently.
2. “vlink=*value(color)*" colors recently visited links.
3. “alink= *value(color)*" makes links briefly blink in the specified color when someone clicks on them.

For example,

```
<body bgcolor="red" text="yellow" link="white" vlink="gray"
alink="green">
```

Cascading Style Sheets

For a User, keeping all his pages consistent is difficult. It becomes very tedious to remember backgrounds, style, font color, hyperlink colors, heading sizes and so much more, and then to code them one at a time into every page. By using cascading style sheets, however, the user can set the style of his page once and be done with it.

A cascading style sheet is a separate non-HTML document with file extension .css (cascading style sheet), in which the user can specify all the stylistic aspects of his web page. Once a style sheet has been created, all web pages cab be linked to it, giving the web site an easy-to-achieve uniformity.

The language for cascading style sheets is not straight HTML, but it's just as easy. Just like an HTML document, it contains the <html> and <head> tags, along with a new tag, <style>, within which styles of various aspects of the web page. Table 15.1 shows some of the attributes that can be used to control the style sheet.

Style	***Purpose***
Background	Can set the background for the entire page, or for a heading, table cell, or paragraph.
Color	Allows the user to set the color of the text, either in hexadecimal format or by color name.
font-family	Determines what style of font will be used.
font-size	Sets the size of the text in points (pt), pixels (px), inches (in), or centimeters (cm).
font-style	Sets the type as normal or italic.
font-weight	Sets the thickness of the type, where 100 is the least heavy and 900 is boldest.
letter-spacing	Indicates the space between each character on the line, in points, pixels, inches, centimeters and percentages.
line-height	Controls the space between lines of type.
text-align	Aligns the text left, centered, right, or justified.
text-decoration	Sets how the text will be displayed; including underlined, struck out, or blinking.

Table 16.1: *Attributes for style sheets*

To use these attributes, place them after the tag for which the style is to be set and without brackets. A semicolon separates each attribute. Curly braces are used. For example, consider the following code,

```
<html><head><tiltle>MSIE Style  Sheet</title>
<style>
body  {color:FFFFFF; font-size:12pt; color:white; text-
align:center}
h1{font-weight:800; font-size:24pt; color:white; text
align:center}
a:link  {font-size:14pt; font-weight:500; color:FFFF80}
</style></head></html>
```

To link this file, saved with .css extension, an additional HTML tag is added on each page. In the <head> section, insert a <link> tag as shown below,

```
<link rel=stylesheet href=″msie.css″ type=″text/css″>
```

The attribute href is used to specify the names of the page containing the style sheet file. The attribute rel specifies the relationship between the linked file and the HTML document. The attribute type defines the type of page the user is linking to.

Putting Images on a Web Page

To put an image (jpg, gif, etc) on a Web page, first move the image file into the same directory folder as the HTML text file. Then insert the following HTML tag at the point in the text where the image is to be appeared (using the name of the image file instead of myimage.gif):

```
<img src="myimage.gif">
```

Here img stands for image and src stands for "source," which is a reference to the location of the image file. Just as with the <A HREF> tag, the user can specify any complete Internet address as the <img src>. Or he can specify just the filename if an image will be located in the same directory folder as the HTML file. Relative addresses can also be used.

Labeling an Image

Consider the following piece of code:

```
<img src="myimage.gif" alt=″My Picture″>
```

The <img> tag above includes a short text message: alt="My Picture". The ALT stands for alternate text because this message will appear in place of the image in older Web browsers that don't display graphics and also by browsers where loading images feature is turned off. Loading images feature is turned off so that the users can see the text on Web pages without wasting time downloading images they don't care about. When automatic image loading is off, the alt message appears instead of an image. Clicking on that message causes the image to be downloaded and displayed. If the image file is large, or there are a lot of images on the same page, the alt message may be on the screen quite a while before it is replaced by the image

Both Netscape Communicator and Microsoft Internet Explorer support this graphics turning off feature. In IE graphics can be turned off by deselecting View | Options... | General | Show Pictures. Internet Explorer also displays the ALT message whenever someone holds the mouse over a graphic image without clicking.

Horizontal Image Alignment

 can be used to align part of page to the center, right margin, or left margin.

Both text and images are affected by these tags. For example, consider the following piece of code:

```
<html>
<head>
<title>
The Olivers and Their House
</head></title>
<body>
<div align=”center”>
Deep in the wilds of Elmore, Vermont lies the lair
of the rare and secretive <i>Familla Oliveria</t><p>
<img src=”house.jpg” alt=”Our Humble Abode”></div>
<img src=”dicko.gif” align=”left” alt=”Dick”>
Each winter, the male of the species disappears into
his octagonal office <i>(left), and comes out only
for skiing, sliding, and trips to the mailbox.
<img src=”jan.gif” align=”right” alt=”Jan”>
The female and young dwell in the main house <i>(right)</i>
Though she occasionally switches places with the male to
Ship orders in the office while he cooks exotic food and
Attends to the offspring. Once each week, local residents
Have the rare opportunity to spot the illusive Olivers as
They gather food in their aging Toyota.
</body>
</html>
```

Say, the above code generates the following on a web page:

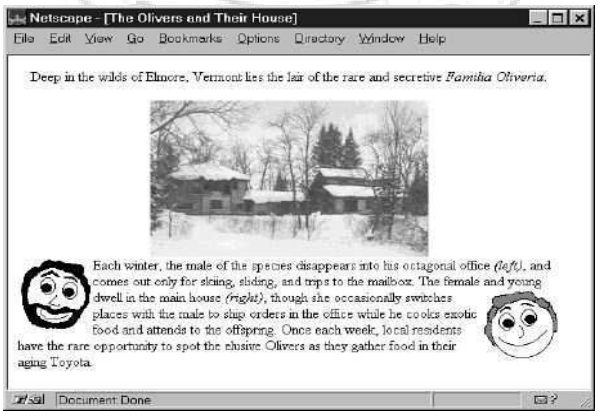

Netscape - [The Olivers and Their House]
File Edit View Go Bookmarks Options Directory Window Help
Deep in the wilds of Elmore, Vermont lies the lair of the rare and secretive Familia Oliveria.
Each winter, the male of the species disappears into his octagonal office (left), and comes out only for skiing, sliding, and trips to the mailbox. The female and young dwell in the main house (right), though she occasionally switches places with the male to ship orders in the office while he cooks exotic food and attends to the offspring. Once each week, local residents have the rare opportunity to spot the elusive Olivers as they gather food in their aging Toyota.
Document Done

Figure 16.1

The first `<img>` tag in the above code occurs between a `<div align=”center”>` tag and the closing `</div>` tag. It can be seen in the figure that this causes the image (as well as the text above it) to be centered on the page.

The user can also make text wrap around images, as it does around the two cartoon images at the

bottom of Figure 1. This can be done by including an ALIGN attribute within the <IMG> tag itself, as shown in the second and third `<IMG>` tags in Figure 1. `<IMG ALIGN="left">` aligns the image to the left and causes text to wrap around the right side of it. And `<img align=”right”>` aligns the image to the right and causes text to wrap around the left side of it. `<img align=”center>` cannot be used because text won't wrap around a centered image. The user must use `<div align=”center”>` if he wants an image to be centered on the page.

Vertical Image Alignment

The user can choose between these and several other options to align images vertically:

- To line up the top of an image with the top of the tallest image or letter on the same line, use `<img align="top">.`
- To line up the bottom of an image with the bottom of the text, use `<img align="bottom">.`
- To line up the bottom of an image with the bottom of the lowest image or letter on the same line, use `<img align="absbottom">`. (If there are some larger images on the same line, `align=absbottom` might place an image lower than `align=bottom`.)
- To line up the middle of an image with the middle of the text, use `<img align="middle">.`
- To line up the middle of an image with the overall vertical center of everything on the line, use `<img align="absmiddle">.` This might be higher or lower than `align="middle",` depending on the size and alignment of other images on the same line.

If no align attributes are included in an `<img>` tag, the image will line up with the bottom of any text next to it.

EXERCISES

1. Use multi level list tags, to form a web page having the text of the following form:
    a. West German Languages
        i. English
            1. British
                i. BBC
                ii. Cockney
                iii. Dubliner
            b. American
                i. Newscaster
                ii. Drawl
                iii. Jive
        ii. Dutch
            1. Hollander
            2. Flemish
            3. Afrikaans

b. East German Languages
   i. Gothic
   ii. German
   iii. Yiddish

2. Write the HTML to make a tiny image of a mouse (named mouse.jpg) appear between the words "Wee sleekit, cow'rin," and the words "tim'rous beastie."

3. How would you give a Web page a black background and make all text, including links, bright green?